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# NEW OR NOTEWORTHY AUSTRALIAN EUPHORBIACEAE — II\*

by

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## SUMMARY

In this paper the following new taxa and combinations are proposed: *Choriceras majus* Airy Shaw; *Cleistanthus peninsularis* Airy Shaw & Hyland (*C. semiopacus* var. *curvaminis* Airy Shaw); *Croton brachypus* Airy Shaw; *C. byrnesii* Airy Shaw; *C. capitis-york* Airy Shaw and var. *pilosus* Airy Shaw; *C. dockrillii* Airy Shaw; *C. magneticus* Airy Shaw; *C. wassi-kussae* Croiz. var. *stockeri* Airy Shaw; several probably new species of *Croton* represented by sterile material; *Dissiliaria laxinervis* Airy Shaw; *Glochidion pruinsum* Airy Shaw; *G. xerocarpum* (O. Schwarz) Airy Shaw comb. nov.; *Mallotus claoxyloides* (F. Muell.) Muell. Arg. var. *cordatus* (Baill.) Airy Shaw comb. nov.; *Phyllanthus ciccoides* Muell. Arg. var. *puberulus* Airy Shaw; *P. sauropodoides* Airy Shaw; *Securinega melanthesoides* (F. Muell.) Airy Shaw var. *aridicola* (Domin) Airy Shaw comb. nov.

The following reductions are made: *Bridelia phyllanthoides* W. V. Fitzg. to *B. tomentosa* B1. var. *tomentosa*; *Croton mirus* Domin to *Codiaeum variegatum* (L.) B1. var. *moluccanum* (Decne) Muell. Arg.; *Croton affinis* Maiden & Baker to *C. acronychioides* F. Muell.; *Croton habrophyllus* Airy Shaw to *C. armstrongii* S. Moore; *Mallotus derbyensis* W. V. Fitzg. to *Grewia* cf. *breviflora* Benth.; *Phyllanthus baccatus* F. Muell. ex Benth. to *P. ciccoides* Muell. Arg.; *Hexaspermum paniculatum* Domin to *Phyllanthus clambooides* (F. Muell.) Dicks.

The following new geographical records are established: *Claoxylon tenerifolium* (Baill.) F. Muell. for the Northern Territory; *Croton* cf. *prunifolius* Airy Shaw for Western

\*For previous paper see *Kew Bulletin* 31:341-398 (1976).

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Australia (described from Lesser Sunda Is. and New Guinea); *Croton* cf. *storckii* (Muell. Arg.) A.C. Sm. for Queensland (described from Fiji); *Croton tomentellus* F. Muell. var., for Queensland; *Glochidion apodogynum* Airy Shaw for Northern Territory and Queensland (described from New Guinea); *G. perakense* Hook. f. var. *supra-axillare* (Benth.) Airy Shaw for the Northern Territory; *G. philippicum* (Cav.) C.B. Rob. for the Northern Territory; *Homalanthus novoguineensis* (Warb.) Lauterb. & K. Schum. for Western Australia, Northern Territory and Queensland; *Mallotus oblongifolius* (Miq.) Muell. Arg. for Queensland (new to Australia); *M. tiliifolius* (Bl.) Muell. Arg. confirmed for Queensland; *Phyllanthus ciccoides* Muell. Arg. for Western Australia and Northern Territory (described from New Hebrides).

In addition, many records of known or little-known species are presented, including a number of old collections found in the Melbourne Herbarium. Appendices concerning *Antidesma* (Stilaginaceae) and taxa proposed by Domin (1927) are provided.

### GENERA

The records are arranged in the order of the genera in Pax & Hoffmann's account of the Euphorbiaceae in Engler & Harms, *Natürl. Pflanzenfam.* ed. 2, 19C: 11-233 (1931), the running numbers being given beneath each generic heading.

### *Glochidion* J.R. & G. Forst (P. & H. 21)

***Glochidion apodogynum* Airy Shaw in *Kew Bull.* 27: 44 (1972).**

*Glochidion apodogynum* was described from a few collections from Papua, the type being Brass 24333 (K). It is now evident that the same form occurs in Australia, but see the further note below.

NORTHERN TERRITORY. Port Darwin, 1884, *M. Holtze* 385 (MEL); Settlement Creek, growing around springs, small tree, x.1922, *Brass* 234 (BRI, MEL, NT 23568).

QUEENSLAND. *Burke District* — Sandy Creek, tree, small yellow flowers, n.d., (? *Armit*) 212, 215 (BRI). *Cook District* — Torres Strait, Prince of Wales Island, Big Creek, 10° 45' S., 140° 15' E., creek bank in savanna woodland, shrub, 8.ii.1975, *E. Cameron* 20271 (QRS); *Ibid.*, woodland on sand ridge, small tree, 9.ii.1975, *E. Cameron* 20353 (QRS); *Ibid.*, 13.ii.1975, *E. Cameron* 20294 (QRS); SE side of Prince of Wales Island, opposite Packe I., closed forest, 16.ii.1975, *E. Cameron* 20116 (QRS); *Ibid.*, *E. Cameron* 20118 (QRS); Laura, sandstone area north of Laura River, near Early Man site, shrub of 3 m, 15° 03' S., 144° 01' E., skeletal soil, 16.v.1975, *Byrnes* 3335 (QRS); Hills about Alma Den, 17° 20' S., 144° 40' E., alt. 500 m, 24.xi.1939, *Thurston* 571 (N. Queensl. Herb. 6786, QRS); First large granite hill south-east of Almaden, on the Petford road, 17° 20' S., 144° 40' E., open forest, alt. 560 m, shrub 3-4 m tall, seeds red, 15.x.1974, *Hyland* 7799 (QRS, K); *Ibid.*, shrub 1-2 m tall, 30.xii.1974, *Hyland* 7932 (QRS, K). The last two gatherings were erroneously included under *G. hylandii* in 1976. *North Kennedy District* — 25 km SE of Townsville, 19° 24' S., 147° 00' E., open forest, alt. 30 m, shrub growing among granite boulders, 14.x.1976, *Hyland* 9142 (QRS). *South Kennedy District* — Port Mackay, n.d., *Amalia Dietrich* 386, 2623 (MEL); SFR 652. Cauley (Cathu), 20° 48' S., 148° 33' E., open forest, alt. 800 m, 13.x.1976, *Hyland* 9139 (QRS). *Port Curtis District* — Near Clairview, 22° 10' S., 149° 30' E., open forest, alt. 10 m, shrub or small tree, 10.x.1976, *Hyland* 9112 (QRS); *Ibid.*, *Hyland* 9111 (QRS).

The difference between these last two specimens, collected only a short distance apart, is so great that had they been separated by many miles one would have thought that two species were involved. The leaves of no. 9112 are oblong-oblancoate or narrowly obovate, 2-3.5 cm wide, and mostly broad-cuneate at the base, and the venation is not impressed. Those of no. 9111 are broadly oblong or oblong-elliptic, 2.5-4.5 cm wide, and equally or unequally rounded or subcordate at the base, and the venation is conspicuously incised and sub-bullately impressed, in this respect making a distinct approach to the complex of forms in New Guinea which I have so far subsumed under *G. fulvirameum* Miq. (originally described from Java). It would seem that a polymorphic population exists at the Clairview locality, a detailed survey of which might yield interesting results.

I think it probable that *G. apodogynum* represents the densely pubescent end of the indumentum spectrum of the complex of which *G. disparipes* occupies the glabrescent end. There seems to be a complete gradation between the two, and, so far as I can see, no

significant difference in their distributions. The pubescent (*apodogynum*) form occurs almost from the north-western to the south-western extremes of the extensive area of *G. disparipes*. For the present I refrain from making a formal reduction, pending confirmatory evidence from further gatherings.

***Glochidion barronense* Airy Shaw in *Kew Bull.* 31: 343 (1976).**

This taxon may represent an extreme form of *G. harveyanum* Domin. I have now seen a number of more or less intermediate specimens which seem to connect the two. The extremes, however, are strikingly different in the character of the female calyx. I prefer to see further material before making a formal reduction.

***Glochidion benthamianum* Domin. See *Kew Bull.* 31: 343 (1976).**

QUEENSLAND (early collections). *Cook District* — Endeavour River, 1881, *Persietz* 59 & 83 (MEL); *Ibid.*, 1883, *Persich* 827 (MEL); 1887, *Persich* 899 (MEL); Daintree River, 1890, *Th. Pentzcke s.n.* (MEL.); Stuart's [?] River, 1891, *S. Johnson s.n.* (MEL); Cairns, viii.1901, *Betche s.n.* (MEL); Bellenden-Ker, alt. 270 m, 1904, *Bailey* 127 (BRI).

***Glochidion disparipes* Airy Shaw. See *Kew Bull.* 31: 345 (1976); cf. George & Kenneally in Miles & Burbidge (ed.), *Biol. Surv. Prince Regent River Reserve, Wildlife Res. Bull. W. Aust.* 3: 47 (1975).**

NORTHERN TERRITORY (early collections). *Sine loc. exact.* [probably Darwin], 1886, *Tenison-Woods s.n.* (MEL); Borroloola, 7.xi.1911, *G.F. Hill* 658 (MEL).

QUEENSLAND (early collections). *Burke District* — Kimberley, Gulf of Carpentaria, 1878, *T. Gulliver* 12 (MEL). *Cook District* — Mt. Surprise Creek, Einasleigh River, shrub, c. 1877-82, *Armit* 252 (MEL); Einasleigh River, small tree or shrub 8 feet high, n.d., [?] *Armit* 640 (MEL). *North Kennedy District* — Muldiva, Herbert's River, large tree, 1892, *Broom* 7 (MEL).

See note under *G. apodogynum*, above.

***Glochidion ferdinandii* (Muell. Arg.) F.M. Bailey. See *Kew Bull.* 31: 346 (1976).**

QUEENSLAND. *Port Curtis District* — Broad Sound, St. Lawrence, x.1873, *T. Gulliver* 71 (MEL); Maryvale, Bowen Creek, alluvial sandy soil, small tree 3-6 m, 7-15 cm diam., beautiful shining foliage, 1875, *Thozet* 846 (MEL); Isopod (Mt. Parnassus), 22° 50' S., 150° 40' E., dry sclerophyll forest, alt. 250 m, 6.x.1976, *Hyland* 9056 (QRS); *Ibid.*, open forest, shrub or small tree with red capsules, 6.x.1976, *Hyland* 9062 (QRS). *South Kennedy District* — Pease's Lookout, 21° 07' S., 148° 31' E., rain-forest, alt. 880 m, small tree 8 m x 20 cm d.b.h., with a flaky bark, 12.x.1976, *Hyland* 9130 (QRS); Mt. Blackwood, 21° 03' S., 148° 56' E., rain-forest, alt. 590 m, 11.x.1976, *Hyland* 9122 (QRS); S.F.R. Cauley (Cathu), 20° 48' S., 148° 33' E., rain-forest, alt. 800 m, small tree with green fruit, 13.x.1976, *Hyland* 9134 (QRS).

During my trip with B. Hyland from Rockhampton to Atherton (see acknowledgements), I was able to confirm the identity of the doubtful collections made by Hyland at Crediton and Pease's Lookout in 1975 (*Kew Bull.*, l.c., footnote), and also to extend the distribution of *G. ferdinandi* 32 km further north by finding it in the Cauley State Forest Reserve, west of Cathu. The material appears quite typical.

***Glochidion hylandii* Airy Shaw in *Kew Bull.* 31: 347 (1976).**

QUEENSLAND. *North Kennedy District* — 9.5 km E. of Tulley, 17° 55' S., 146° 00' E., in palm forest, *Licuala* dominant, erect shrub, 1.2 m high, fruits red, 27.xi.1967, *Boyland* 562 (BRI).

The most southerly known locality for the species so far.

***Glochidion lobocarpum* (Benth.) F.M. Bailey. See *Kew Bull.* 31: 348 (1976).**

QUEENSLAND. *Cook District* — New Holland, 1770, *Banks & Solander* (MEL); Endeavour River, 1882, *Persietz* 247 (MEL); *Ibid.*, 1883, *Persich* 160 (MEL); *Ibid.*, 1886, *Persich* 772 (MEL); Trinity Bay, ii.1881, *Karsten s.n.* (MEL); Upper Stuart [?] = Stewart River, 1891, *S. Johnson s.n.* (MEL). *North Kennedy District* — Hook I., near Whitsunday I., Picnic Beach, small branching tree, dark bark, xii.1971, *S. Webster s.n.* (BRI); Hinchinbrook I., coast opposite Agnes I., growing at edge of shore line, tree 6 m high, erect, covered in fruit, 19.viii.1975, *P. Sharpe* 1750 (BRI). *South Kennedy District* — Port Mackay, n.d., *Amalia Dietrich* 386 (MEL); *Ibid.*, x.1887, *Griffith* 465 (MEL). *Port Curtis District* — Rockhampton, dwarf shrub, flower green, 2.ii.1863, [Dallachy] 286 (MEL); *Ibid.*, xii.1865, *Amalia Dietrich* 126, 670, 879, 1788, 2118, 2143 (MEL); Table Mt., small tree, very rare, seeds orange-red when ripe, ii.1867, *O'Shanesy* 45 (MEL); Neerkool Creek, Capricorn, iii.1867, *Bowman* 71; Marian Vale [?] = Maryvale, or Miriam Vale, much-branched tree 20 feet [6 m], ii.1869, *O'Shanesy* 1025 (MEL); near The Caves, 23° 10' S., 50° 30' E., gallery forest, alt. 100 m, 8.x.1976, *Hyland* 9088

(QRS); Moore's Creek, 23° 20' S., 150° 35' E., open forest, alt. 100 m, multistemmed shrub or small tree, male flowers yellow, 9.x.1976, *Hyland 9089* (QRS). *Wide Bay District* — Fraser Island, vi.1914, *F.C. Epps 134* (BRI, NSW).

***Glochidion perakense* Hook. f. var. *supra-axillare* (Benth.) Airy Shaw in *Kew Bull.* 27: 72 (1972). See *Kew Bull.* 31: 349 (1976).**

*Phyllanthus ferdinandi* var.? *mollis* Benth., Fl. Austr. 6: 97 (1873), pro parte.

*Glochidion benthamianum*, 'poor collection', sec. Airy Shaw in *Kew Bull.*, 31: 344 (1976), in obs., non Domin.

NORTHERN TERRITORY. Adelaide River, slender tree up to 30 feet [9 m], 1890, 1892, [*Holtze*] 1128 (MEL); Black Jungle, 32 miles [51 km] SE of Darwin, infrequent in seasonal swamp near creek, tree 12' [3.5 m] high, but branches fallen, corolla yellow, fruit green-brown, 27.v.1958, *Chippendale 4490* (BRI, NSW, NT); Daly River levee, 13° 40' S., 130° 30' E., 12.ix.1962, *Muspratt SS069* (NT 9687, DNA 5729); Coomalie Creek, edge of permanent stream, tree ± 25 ft. [7.5 m], 18.xii.1968, *Byrnes NB 1223* (NT); Ibid., Batchelor Road, 13° 01' S., 131° 07' E., in water at edge of creek, tree to 5 m high, small yellow flowers, green furry fruit, 30.iii.1976, *Must 1352* (NT 49761, DNA 10854).

These are the first specimens of this plant that I have seen from the Northern Territory. The five localities all lie within a comparatively limited area to the south and south-east of Darwin. The twigs, leaves, females flowers and fruits and even the pedicels and exterior of the male flowers in this form are strongly puberulous.

QUEENSLAND. *North Kennedy District* — Rockingham Bay, 1870, *Dallachy s.n.* (MEL, K, syntype of *Phyllanthus ferdinandi* var. *mollis* Benth.). *South Kennedy District* — S.F.R. 652, Cauley, 20° 50' S., 148° 30' E., rain-forest, alt. 800 m, tree, trunk 20 cm d.b.h., bark papery flaky, 7.v.1975, *Hyland 4181* RFL.

The latter collection represents the northernmost locality from which I have seen var. *supra-axillare* in its more southerly area in east Queensland, which extends southwards to Brisbane. North of this it reappears in the region of Rockingham Bay.

It is now evident that *Phyllanthus ferdinandi* var.? *mollis* Benth. was based upon material of two quite distinct species.

Since (*Kew Bull.* 31: 344 (1976)) referring to a plant of the Dallachy collection cited above as a 'poor collection' of *G. benthamianum*, I have been able to examine the very much better sheet of the same gathering in the herbarium at Melbourne. Whereas the Kew duplicate consists of a single leafy branchlet with seven fruiting pedicels from which all the fruits have fallen, the Melbourne sheet bears four such branchlets to which four capsules are still attached. From this it is at once evident that the plant is not *G. benthamianum*, but a puberulous form of *G. perakense* var. *supra-axillare*. Both sheets bear the determination '*P. ferdinandi* var. *mollis*' in Bentham's handwriting, and form part of his type material of that variety.

The remainder of Bentham's type material of var. *mollis* is a good collection (Rockingham Bay, 1872, *Dallachy* (K); see *Kew Bull.* 27: 58 (1972)) of *Glochidion philippicum* (Cav.) C.B. Rob. I now designate this collection as the **lectotype** of var. *mollis*.

***Glochidion philippicum* (Cav.) C.B. Rob. See *Kew Bull.* 31: 349 (1976).**

NORTHERN TERRITORY. Port Darwin, n.d., *Bleeser 60* (teste O. Schwarz in *Feddes Repert. Spec. Nov. Regni Veg.* 24: 87 (1927)); Wagait Reserve, 13° 12' S., 130° 40' E., monsoon rain-forest, tree 8 m high, trunk straight angular and white, fruit red, 16.i.1973, *Dunlop 3106*.

QUEENSLAND. *Cook District* — Daintree River, 1881, *Pentzcke 8* (MEL); Ibid, 1890, *Pentzcke s.n.* (MEL); Ibid., iii.1914, *Rosenstrom 7* (BRI); Greenhills, nr. Cairns, n.d., *Illingworth 74* (BRI); Kemerunga, n.d., Cowley 34 (BRI); State Forest Reserve Danbulla, slope near creek, loam from granite, on scrub edge, alt. 660 m, tree 9 m high, 105 cm g.b.h., crown sparse and spreading, 19.x.1929, *Doggrell A21* (BRI); 1 mile [1.6 km] SW of Mossman, gallery rain-forest along river, alt. 15 m, spreading tree 15 m high, bark cracked and fissured, mid grey-brown; leaves rather dull glossy dark green above, paler below; flowers yellowish; fruit deep scarlet when ripe, 9.x.1964, *Schodde 4158* (BRI); Whitefield Range, nr. Cairns, on edge of rain-forest, tree 9 m, spreading crown, 6.v.1967, *Olsen 376* (BRI, NSW); Nesbit River, 13° 30' S., 143° 25' E., alt. 30 m, small tree 15 m tall, bark flaky, 8.ix.1973, *Hyland 6830* (BRI). *North Kennedy District* — Herbert River, small tree 20 ft [6 m] high, small yellow flowers, dark green shining leaves, leaves alternate, 4.x.1866, *Dallachy s.n.* (MEL); Ibid., large tree, yellow flower, 14.x.18., *Dallachy s.n.* (MEL); Ibid, 7.xii.1867, *Dallachy s.n.* (MEL).

These records represent considerable extensions of the known range of *G. philippicum* in Queensland, both northward into the Cape York Peninsula and southward into North Kennedy District. The species has apparently not been re-collected in the latter district for over a century. It is also evidently extremely scarce in the Northern Territory.



***Glochidion pruinosa* Airy Shaw, sp. nov.**

Inter *G. ferdinandii* (Muell. Arg.) F.M. Bailey et *G. pungens* Airy Shaw quasi medium tenens, sed foliis subtus conspicue glauco-pruinosis supra opacis nec nitidis ab utroque recedit; a *G. pungente* praeterea flore ♀ minore stylo breviori graciliore lobis divaricatis manifeste differt. TYPUS: Queensland, Hyland 7064 (K, holotypus; QRS, isotypus).

*Frutex* vel *arbor parva*, ramulis glabris (Hyland 7064) vel breviter adpresse fulvo-puberulis (Sayer 129). *Folia* elliptica vel oblongo-elliptica, 4-9 cm longa, 2-4 cm lata, basi late cuneata vel subrotundata, ima basi in petiolum brevissime decurrentia, apice breviter vel brevissime acutata et saepe acutissime mucronata, margine integro plano vel angustissime reflexo, firme chartacea, glabra, laevia, siccitate supra olivaceo-brunnea vel fusca, subtus conspicue glaucescentia vel purpurascens-pruinosa; costa modice gracilis, subtus prominula, supra vix elevata vel sulco tenui percursa; nervi laterales 6-8-jugi, gracillimi, late arcuato-patuli, contra glaucedinem conspicui, prope marginem diffuse anastomosantes; nervi minores tenuissimi, laxe reticulati; petiolus 2-4 mm longus, 1 mm crassus, glaber; stipulae anguste subulatae, acutissimae, 2-3 mm longae. *Inflorescentiae* axillares, valde pauciflorae. *Flos* ♂ pedicello usque 8 mm longo glabro suffultus. *Tepala* exteriora late elliptica, 2-3 mm longa, 1.75 mm lata, obtusa, interiora aequilonga sed angustiora, 1.5 mm lata, omnia carnosula, glabra. *Stamina* 3, antheris oblongis 1 mm. longis, connectivis subulatis erectis conspicuis 0.5-0.6 mm longis. *Flos* ♀ pedicello crassius glabro (Hyland) vel puberulo (Sayer) 2-3 mm longo suffultus. *Tepala* ovata, 1.5-2 mm longa, 1-1.5 mm lata, acuta, glabra, dorso (praesertim inferne) carinata, crassiuscula, erecta, apice leviter divaricata. *Ovarium* globosum, 1-1.5 mm diametro, glabrum. *Stylus* 2 mm longus, 0.5 mm crassus, glaber, apice in segmenta (4-)5(-6) angusta 0.5-1 mm longa acuta primum erecta serius divaricata divisus. *Capsula* 5-6-locularis, depresso pulviniformis, 10-13 mm diametro, 7-8 mm alta, adpectu inflata, late rotundato-lobata, glabra, loculis saepe distincte carinatis, vertice profunde intruso, stylo in vertice persistente lobis demum erectis, pedicello gracili 5-6 mm longo puberulo (Sayer); semina (immatura?) triquetra, 4 mm longa, dorso rotundata.

QUEENSLAND, Cook District — N.P.R. 164 Thornton Peak, 16° 10' S., 145° 20' E., montane rain-forest bordering on heath, alt. 1260 m, shrub or small tree, 13.xi.1973, Hyland 7064 (type); Mt. Bellenden-Ker, alt. 1560 m, tree 35 ft [10.5 m], 12 in [30 cm] diam., 1887, Sayer 129 (MEL).

Herbarium material of this montane plant attracts attention by the whitish or purplish pruinosity of the leaf-undersurface. It is, however, obviously closely related to *G. pungens*, having the same sharply pointed leaf-apex and a similar tendency for the lamina to be folded along the line of the midrib. The female flower with its conspicuously exerted style is midway in size between those of *G. pungens* and *G. ferdinandii*.

The two collections cited, from Thornton Peak and Mt. Bellenden-Ker, are not quite identical, the former being entirely glabrous but the latter having puberulous branchlets and female pedicels. Further collections are needed to show the extent of variation in the species and also to assess the relationship of the plant to *G. ferdinandii* var. *pubens* Maiden ex Airy Shaw (*Kew Bull.* 31: 346 (1976)) and *G. hylandii* Airy Shaw (l.c.: 347).

***Glochidion* cf. *sessiliflorum* Airy Shaw in *Kew Bull.* 31: 350 (1976).**

QUEENSLAND, Cook District — T.R. 146, Tableland Logging Area, 15° 45' S., 145° 15' E., rain-forest, alt. 660 m, tree, trunk 50 cm d.b.h., buttressed, fluted; bark tessellated, flaky, 9.vii.1975, Hyland 3221 RFK (QRS, K); R 1073, Rooky Logging Area, 16° 40' S., 145° 30' E., rain-forest, alt. 440 m, tree, 40 cm d.b.h., fissured, tessellated and flaky bark; buttresses present; dead bark layered, 2.iii.1976, Hyland 3392 RFK & 3393 RFK (QRS, K); State Forest Reserve 251, Charmillan Logging Area, 17° 40' S., 145° 30' E., clearing in rain-forest, alt. 750 m, shrub 3 m tall; flowers cream; fruit greenish yellow, some with pink suffusions, 29.ix.1976, Dockrill 1271 (QRS, K). North Kennedy District — Sea View Range, fine small tree 20 to 30 feet high, fruit white, foliage dark green, 31.v.1864, Dallachy 23 (MEL); Ibid, small tree; fine light green foliage; flower small, yellow, does not dry well; no seed, 10.xi.1864, Dallachy 31 (MEL).

Dallachy's gatherings were no doubt subsumed by Bentham under his all-embracing *Phyllanthus ferdinandii*.

The above collections from an area extending from Cooktown to south of Ingham, differ from the type of *G. sessiliflorum* (Hyland 7805, Claudie River, Cape York Peninsula) in possessing a distinct pedicel to the female flower, almost 5 mm long in Dockrill 1271. In the dried state the foliage assumes a rather characteristic dark, smooth, oily green, which is

not the case in the type specimen. *Hyland 3221* RFK is distinct in the possession of a short but conspicuous style. It is possible that a distinct taxon is involved, but further material from the type area will be needed in order to assess the constancy of these features.

***Glochidion xerocarpum*** (O. Schwarz) Airy Shaw, comb. nov., cum descr. amplif.

*Phyllanthus xerocarpus* O. Schwarz in Feddes Repert. Spec. Nov. Regni Veg. 24: 87 (1927); cf. McKee in *Contrib. N.S.W. Natl. Herb.* 3: 233 (1963). Type: Northern Territory, Darwin, 1927 *Bleeser* 495 (B; NSW, isotype).

*G. ferdinandii* sec. Specht in Specht & Mountford (ed.), *Rec. Amer.-Aust. Sci. Exped. Arnhem Land*, 3, Bot. & Ecol.: 252, 398, 461 (1958), pro parte, non (Muell. Arg.) F.M. Bailey.

*G. mindorense* subsp. *mindorense* sec. Airy Shaw in *Kew Bull.* 27: 21 [non 66 nec 72] (1972) & 29: 291 (1974), pro maiore parte, non C.B. Rob.

*G. disparipes* sec. Airy Shaw in *Kew Bull.* 31: 345 (1976), quoad *Specht* 24 & 860, non Airy Shaw s. str. (1972).

*Glochidion* sp., Dunlop, Latz & Maconochie in *N. Terr. Bot. Bull.* 1: 22 (1976).

A formis glabrescentibus *G. disparipedis* Airy Shaw foliis ad aspectu crassiusculis laevissimis subtus opacis interdum leviter glaucescentibus, venis minoribus fere immersis nec prominulis, a *G. ramifloro* J.R. & G. Forst. fructu maiore subsessili subinflato, a *G. mindorensi* C.B. Rob. calyce ♀ puberulo capsula 5-loculari dignoscendum.

*Frutex* vel *arbor* usque 10 m alta, ramulis modice robustis primum breviter pubescentibus demum minute puberulis, cortice vivo interdum insigniter cinereo. *Folia* ovata vel oblongo-elliptica, 4-10 cm longa, 2-5 cm lata, basi (saepè leviter asymmetrica) rotundata vel interdum cuneata vel raro cordatula, in apicem obtusum vel rotundatum vel rarius subacutum citius contracta, rarius late obtusissime cuspidata, margine integro anguste reflexo, firme chartacea vel subcoriacea, costa excepta glaberrima, laevissima sed paullum tantum nitidula vel imò opaca, siccitate plumbeo-brunnescentia vel viridula; costa gracilis, utrinque prominula vel supra fere plana, glabra vel basin versus parce puberula; nervi laterales gracillimi, 6-12-jugi, utrinque tenerrime prominula, late patuli, prope marginem arcuato-anastomosantes; nervi minores tenuissimi, fere immersi, inconspicui; petiolus 2-5 mm longus, 1-2 mm cressus, minute puberulus; stipulae subulatae, 1-1.5 mm longae, acutae, puberulae, caducae. *Fasciculi* uni- vel bi-sexuales, pauciflori, axillares. *Flos* ♂ pedicello tenui glabro 5 mm longo suffultus; tepala obovata vel spatulata, obtusa, glabra, exteriora fere 3 mm longa, interiora paullo minora; antherae in massam oblongam fere 1 mm. longam connatae. *Flores* ♀ solitarii vel bini, sessiles vel subsessiles; tepala oblongo-ovata, 2.5 mm longa, exteriora 1.5 mm lata, interiora angustiora, obtusa vel subacuta, extra puberula; ovarium depresso globosum, 1.5 mm diametro, 1 mm altum, dense adpresse puberulum; styli in massam depresso pulviniformem 0.5 mm diametro apice 6-lobulatam circa foramen centrale connati, glabri. *Capsula* pedicello brevi puberulo suffulta, depresso globosa, ad aspectu quasi inflata, 1.5-2 cm diametro, 5-8 mm alto, 5-locularis, firme crustacea, minute puberula, siccitate castanea, quoque segmento sulco mediano percurso; semina triquetrum-sphaerica, 4 mm diametro, laete rubra.

NORTHERN TERRITORY. Port Darwin, 1884, *M. Holtze* 385 (MEL); Port Darwin, Mindel Beech, dry jungle, iv. 1927, *Bleeser* 495 (NSW, isotype); Nightcliff, Darwin, 12° 22' S., 130° 53' E., in monsoon forest on truncated lateritic podsol, 20.iii.1948, *Specht* 24; Lee Point, 12° 20' S., 130° 55' E., beach front, shrub to 4 m high, small yellow flowers, 30.i.1974, *Must* 1171 (NT); Gunn Point, 12° 09' S., 130° 58' E., shrub to 2 m, cream flowers, red berries, 27.vii.1973, *McKean* 1123 (NT); Smith Point, Port Essington, 11° 10' S., 132° 10' E., rain-forest, alt. 5 m, tree 20 cm d.b.h., bark fissured, flaky, 25.xi.1975, *Hyland* 3374 RFK (QRS, K); Elcho Island, Warangaiyu Lagoon, 11° 57' S., 135° 43' E., deciduous vine thicket, stabilised coastal dune, 20.vii.1975, *Dunlop* 3960 (NT); Wessel Is., 11° 11' S., 136° 44' E., rare in crevice of dissected sandstone, small tree to 3 m, 1.x.1972, *Latz* 3365 (NT 36887); Yirrkala, 12° 12' S., 136° 47' E., in monsoon forest on coastal dune, 11.viii.1948, *Specht* 860 (K); Gove, 12° 15' S., 136° 50' E., open forest on the edge of a swamp between sand dunes, alt. 5 m, 7.xi.1974, *Hyland* 7861 (QRS); Groote Eylandt, Angurugu, 13° 59' S., 136° 27' E., edge of jungle, small spindly shrub, small yellow flowers and green seed-capsule with red seeds, 25.vii.1973, *Levitt* 320 (DNA 9243); Gulf of Carpentaria, Maria Island, 14° 54' S., 135° 44' E., limestone outcrop, patch of monsoon scrub, 17.vii.1972, *Dunlop* 2873 (N.T. 36358).

I had prepared the above description on the assumption that this was a new species, when my attention was drawn by John Maconochie, Australian Botanical Liaison Officer at

Kew for 1976-7, to Schwarz's paper in Fedde's *Repertorium* (l.c.) on plants collected by Bleeser in tropical Australia. Schwarz's description of *Phyllanthus xerocarpus* agreed quite well with my supposed new species. I then found from McKee (l.c.) that a duplicate of the type of *P. xerocarpus* was preserved in the New South Wales National Herbarium and I was able to borrow this crucial specimen. The material is very poor, consisting of two branchlets, half-a-dozen detached leaves, one male and a few female flowers and a detached capsule, but is sufficient for recognition, and is certainly the plant in question. Clyde Dunlop, of Darwin, kindly went to Mindil Beach, the type locality, to discover whether *Glochidion xerocarpum* still persisted there, but found that the considerable area of monsoon forest that it formerly held had recently been completely cleared for playing fields and a caravan park.

This species extends through Eastern Malesia to Java, Celebes, Sabah and the southern Philippines; see collections cited under *G. mindorensis* in *Kew Bull.*, l.c. It differs from true *G. mindorensis* C.B. Rob. in its densely puberulous ♀ calyx, in its depressed pulvinate style, and in its usually 5-(not 4-) locular capsule; from *G. ramiflorum* in its considerably larger, subinflated, subsessile capsule (as well as in its puberulous ♀ calyx); and from both these species and the closely related *G. disparipes* Airy Shaw in its characteristically thickish smooth-looking leaves with the minor nerves almost immersed beneath. From *G. sessiliflorum* Airy Shaw it differs in its puberulous ♀ calyx, and usually in the rounded leaf-base, as well as in the texture of the leaves. It has a predilection for sublittoral situations, at low altitudes, frequently on off-shore islands.

*Glochidion mindorensis* subsp. *harveyanum*, subsp. *glabrum* and subsp. *paludicola* (*Kew Bull.* 27: 22-23 (1972)) must be restored to specific rank; cf. *Kew Bull.* 31: 347, 352 (1976).

### **Securinega Juss.**

(P. & H. 27)

***Securinega leucopyrus* (Willd.) Muell. Arg.** in DC., *Prodr.* 15 (2): 451 (1866); Benth., *Fl. Austr.* 6: 116 (1873); Airy Shaw in *Kew Bull.* 25: 493 (1971) & 26: 340 (1971), q.v. for further synonymy.

*Flueggea leucopyrus* Willd., *Spec. Pl.* 4: 757 (1805); Bailey, *Queensl. Fl.* 5: 1426 (1902).

Records additional to those of Bentham, l.c.:

QUEENSLAND. *Cook District* — Chillagoe, amongst boulders on limestone outcrop, alt. 360 m, tree about 3-5 m high, green leaves, 22.i.1931, *Winders 6770*. *Port Curtis District* — Pine Mountain, 22° 45' S., 149° 50' E., shrub or small tree 3.6 m high, outer bark dark grey and fissured slightly, 17.x.1951, *L.S. Smith 4758*; North of Marlborough, 22° 45' S., 149° 45' E., alt. 100 m, open forest, 10.x.1976, *Hyland 9107* (QRS).

*Securinega leucopyrus* has an extremely sparse and scattered distribution in north-eastern Queensland. The only localities mentioned by Bentham were the Gilbert River, the Bowen River and Rockhampton.

***Securinega melanthesoides* (F. Muell.) Airy Shaw** in *Kew Bull.* 31: 352 (1976).

WESTERN AUSTRALIA. Kimberley, 1884, *Panton s.n.* (MEL).

NORTHERN TERRITORY. First large outcrop 4 miles [6.5 km] E. of Desert Block, N. of road, Amburla Stn., 23° 20' S., 133° E., tree about 5' high, 3.i.1967, *Latz N.T.* 12079 (NT).

This is the most southerly locality from which I have seen this species.

QUEENSLAND. *Burke District* — 'Laurel-leaved shrub, 8-10 ft in height, branching abundantly at ground level. A frequenter of creek-sides in the Cloncurry district, and an associate of *Vitex viminifolia* in the channels, which on the Gulf fall takes the place of lignum [*V. lignum-vitae* A. Cunn.? *Muehlenbeckia* sp.?]. Shrub loses its leaves in the dry time of year, but freshens up at once with early summer rains, flowering profusely when creeks run with thunderstorm water. Not browsed by stock, as there is generally other feed about when this shrub is in leaf.' *S.E. Pearson 136* (BRI).

No such name as '*Vitex vimilis*' is listed in the *Index Kewensis*. It was probably a mistake for *Ventilago viminalis* Hook. (*Rhamnaceae*).

var. ***aridicola* (Domin) Airy Shaw**, comb. nov.

*Flueggea virosa* var. *aridicola* Domin in *Biblioth. Bot.* 22: 878 (Heft 89: 324) (1927).

QUEENSLAND. *Burke District* — dürre Hügel bei Cloncurry, ii.1910, *Domin* 5954, 5955 (type, PR).

This is no doubt an extreme ecotype from an exceptionally arid situation. I have seen no other collections to match it in the small size of the leaves (rarely exceeding 2.5 cm in length and mostly much less) and in the character of venation. It seems therefore to deserve recognition. On the other hand *Domin's* f. *reticulata* (l.c.) is typical of many of the more strongly nerved forms of *S. melanthesoides* and is not worth maintaining.

### **Margaritaria** L.f.

(P. & H. 27/a, from 29 Sect. XII)

#### **Margaritaria dubium-traceyi** Airy Shaw & Hyland in *Kew Bull.* 31: 357, fig. 1 (1976).

QUEENSLAND. *Burke District* — Adel's Grove, Lawn Hill River [c. 55 km from Northern Territory boundary], tree 3-5 m high, with dense bright green foliage, c. 1926, *A. De Lestang* 142 (BRI); 25 km SSE of Normanton, on Normanton-Croydon road, 17°53' S., 141° 12' N., in low woodland of *Melaleuca acacioides*, *Bauhinia carronii* and *Terminalia* sp., vi. 1972, *G.R. Beeston* 1 (BRI); 65 km ESE of Normanton, 18° 02' S., 141° 38' E., in low open forest of *Melaleuca acacioides*, *Bauhinia carronii* and *Terminalia* vi. 1972, *G.R. Beeston* 73 & 76 (BRI); Approximately 5 km S. of Clarina Creek on Gum Creek Homestead road, just S. of Normanton-Croydon road, 17° 3' S., 141° 0' E., growing in Duplex Dy 3.8 soil, in *Melaleuca acacioides*, *Bauhinia* & *Terminalia* forest, 7.v.1974, *T.J. Hall* s.n. (BRI). *Cook District* — Robertson River (S. of Forsayth, approx. 19° S., 143° 30' E.), c. 1877-82, *Armit* 740 (2 sheets) (MEL).

### **Phyllanthus** L.

(P. & H. 29)

#### **Phyllanthus** (§*Nymania*) **clamboides** (F. Muell.) Diels in *Notizbl. Bot. Gart. Berlin-Dahlem* 11: 309 (1931); Airy Shaw in *Kew Bull.* 31: 359 (1976), q.v.

*Hexaspermum paniculatum* Domin in *Biblioth. Bot.* 22: 870 (Heft 89: 316) (1927), *synon. nov.*

The type collection of *Hexaspermum paniculatum* from Harvey's Creek, is typical material, in female flower and fruit, of the common New Guinea and Solomons species that has long been known under the name *Phyllanthus choristylus* Diels, but which is now regarded as a synonym of *P. clamboides* (see *Kew Bull.*, l.c.).

#### **Phyllanthus** (§ *Nymania*) **cuscutiflorus** S. Moore in *J. Bot. Brit. & For.* 43: 148 (1905); Webster & Airy Shaw in *Kew Bull.* 26: 99 (1971); Airy Shaw in *Kew Bull.* 31: 360 (1976), in obs.

QUEENSLAND (early collections). *Cook District* — Endeavour River, 1882, *Persiech* 177, 195 (MEL); *Ibid.*, 1882, *Persiech* 709 (MEL); 1883, *Persiech* 96 (or 196 or X96?) (MEL); 1886, *Persiech* 743 (MEL); Trinity Inlet, small tree, n.d., *W. Hill* 262 (MEL).

Two modern collections, *Brass & White* 153, from the Cook Highway 19 miles [30 km] N. of Cairns, and *Stephens* in *N. Queensl. Nats. Club* 11696, from Brinsmead Road, Freshwater (both only a few miles from the type locality), differ strikingly in their male inflorescences. In the *Brass & White* collection the male flowers are borne directly in the axils of the foliage leaves, on exceedingly elongate capillary pedicels up to 2.5 cm long. In the *Stephens* specimen they are borne on very slender fascicled leafless branchlets up to 8 cm long, arising from the axils of the foliage leaves on the main branches, and the flowers, which are still in the bud stage, are much more shortly pedicelled, up to 5 mm. The latter point may not be important, as the male pedicels of *Phyllanthus* sometimes undergo enormous elongation at anthesis, but the slender leafless branchlets are striking. Both collections exhibit the thin, brittle leaves, glaucous beneath, that seem to be characteristic of *P. cuscutiflorus*. There is need of observations on the variation of this plant in the field.

#### **Phyllanthus** (§ *Emblastrum*) **lamprophyllus** Muell. Arg. See *Kew Bull.* 31: 361 (1976). Add to references: S. Moore in *J. Linn. Soc. Bot.* 45: 217 (1920).

*P. buxifolius* sec. F. Muell., *Descript. Notes Papuan Pl.* 1 (2): 23 (1876) & *Fragm.*



Phytogr. Austr. 10: 121 (1877); Bailey, Queensl. Fl. 5: 1423 (1902); non *Scepasma buxifolium* Reinw. ex Bl.

QUEENSLAND. *Cook District* — Cairns, 1877, *Fitzalan* (MEL). Barron River, 1891, *S. Johnson* (MEL). *North Kennedy District* — Estuary of the Burdekin River, n.d., *Fitzalan* (MEL). *Port Curtis District* — Basin Creek, 21° 45' S., 149° 22' E., gallery forest, alt. 20 m, shrub, 18.x.1976, *Hyland 9113* (QRS).

The latter locality lies some 370 km south of the mouth of the Burdekin River, the previous southernmost known locality.

**Phyllanthus** (§ **Kirganelia**) **ciccoides** Muell. Arg. See Webster & Airy Shaw in *Kew Bull.* 26: 88 (1971).

*P. novae-hollandiae* see Baill., *Adansonia* 6: 343 (1866), non Muell. Arg.

*P. baccatus* F. Muell. ex Benth., Fl. Austr. 6: 102 (1873); Ewart & Davies, Fl. N. Terr. 163 (1917); Gardner, Enum. Pl. Austr. Occid. 72 (1931); Chippendale in *Proc. Linn. Soc. N.S.W.*, 96: 245 (1972); Airy Shaw in *Kew Bull.* 31: 361 (1976); *synon. nov.*

For further synonyms see Webster & Airy Shaw, l.c.

var. **ciccoides**.

The following specimens are additional to those cited in Bentham, l.c. and in *Kew Bull.* 31: 361 (1976) under *P. baccatus*.

WESTERN AUSTRALIA. E. Kimberley District, 1896, *Helms 217*.

NORTHERN TERRITORY. Fitzroy River, 1881, *G. Paterson s.n.* (MEL); Timber Creek [Victoria River, Newcastle Range], on creek alluvium, woody bramble-like shrub, 19.v.1971, *Byrnes 2209*.

var. **puberulus** Airy Shaw, var. nov.

Ramulis foliis utrinque pedicellis crispule puberulis.

QUEENSLAND. *Cook District* — Near Cooktown, Endeavour River, bank of river at dry season level, on sand; slender erect stem 2.5 m tall; dull greenish leaves, pallid beneath; black fleshy fruit, 14.v.1970, *S.T. Blake 23229* (K, holotype; BRI, isotype).

*P. ciccoides* has a rather wide distribution from New Guinea eastwards and south-eastwards. It occurs as two distinct varieties, the typical one, var. *ciccoides*, which is glabrous, and the above-described var. *puberulus*, which is usually rather densely and crisplously puberulous. All the plants that I have seen from Western Australia and the Northern Territory represent the glabrous var. *ciccoides* (*P. baccatus* F. Muell. ex Benth.), but the solitary gathering so far seen from Queensland is densely puberulous, and I have made it the type of var. *puberulus*.

Both varieties occur in north-eastern New Guinea and Papua, but apparently only var. *puberulus* in the Louisiades and the Bismarcks. I have seen no representative of *P. ciccoides* from Western New Guinea. By far the most prevalent form in the Solomons and the Santa Cruz group is var. *puberulus*, but I have seen a single collection of var. *ciccoides* from Santa Ysabel (Mt. Sasari, near Maringe Lagoon, 1963, *Whitmore* BSIP 2426). On the other hand in the New Hebrides (*P. ciccoides* was described from a *Forster* collection from the island of Tanna) the common form is var. *ciccoides*, but at Kew there is a specimen from the "New Hebrides", without further locality, coll. Dr. A. Morrison s.n., 18.v.1896, which is certainly var. *puberulus*.

Having now examined more closely than hitherto the rather copious material of *P. ciccoides* preserved at Kew, I have no hesitation in reducing *P. baccatus* to it.

**Phyllanthus** (§ **Kirganelia**) **novae-hollandiae** Muell. Arg. See Webster & Airy Shaw in *Kew Bull.* 26: 89 (1971). Add to references: Bailey, Queensl. Fl. 5: 1418 (1902).

QUEENSLAND. *Cook District* — "From Lat. 140° [? 14°] Eastern Watershed 30 miles from coast", shrub, 2.ix.1873, *R. Stewart 139* (Hann, Cape York Exped.) (K); Endeavour River, 1886, *Persich 829* (MEL); Open sandy floodbanks of Coen River, alt. 200 m, tree 5 m high, flowers green, fruit blackish-purple, 5.viii.1948, *Brass 19811*; Murray Island, E. of Torres Straits, 9° 55' S., 144° 02' E., 23.viii.1970, *M. Lawrie 93* (BRI); Ingham Island, 27.vii.1973, *Stoddart 4055*; East Hope Island, 4.ix.1973, *Stoddart 4431*; Pelican Island, 27.x.1973, *Stoddart 4924*. *North Kennedy District* — Edgecumbe Bay, n.d., *Dallachy s.n.* (type collection — MEL, K); 'Kinrara' Homestead, 18° 30' S., 145° 3' E., is closed forest on basalt rock, shrub about 2.5 m with long spreading branches; leaves green above, paler beneath; flowers greenish, alt. 570 m, 22.xi.1941, *S.T. Blake 14444* (K).

**Phyllanthus** (§ ?) **brassii** C.T. White in *Proc. Roy. Soc. Queensl.* 1935, 47: 81 (1936).  
 QUEENSLAND. *Port Curtis District* — Bulburin State Forest, 10 km E. of Builyan, 24° 30' S., 151° 30' E., rain-forest, alt. 400 m, shrub 1.5 m high, flowers [♂] red, 14.iv.1974, *Monteith* in *Moriarty* 1976 (QRS).

This is a remarkable range extension for a species that has hitherto been regarded as an endemic confined to the summit of Thornton Peak, about 65 km north of Mossman, in Cook District. The ample material (5 sheets) seems to agree with the type perfectly. *Phyllanthus brassii* is not closely related to any other Australian (or New Guinea) species, but shows probable affinity with some from New Caledonia, e.g. *P. aeneus* Baill., *P. francii* Guillaum., *P. baladensis* Baill.

**Phyllanthus** (§ ?) **sauropodoides** Airy Shaw, sp. nov.

Forsan ex affinitate remotiore *P. caesii* Airy Shaw & Webster et *P. verrucicaulis* Airy Shaw (novo-guineensium), sed foliis chartaceis multo minoribus usque 6 x 2.8 cm tantum, staminibus liberis, capsula usque 6 mm diametro, sepalis femineis persistentibus longe distat. **TYPUS:** Queensland, Bulburin Forest, A.C. Robinson 27A1 (BRI, holotypus).

*Frutex* vel *arbor*, statura ignota, ramulis teretibus vel junioribus interdum distincte complanatis 1-3 mm. crassis laevissimis glaberrimis foliosis. *Folia* elliptica vel ovata, 3.5-10.5 cm longa, 1.5-4.2 cm lata, basi late cuneata, apice brevissime acute caudata, ipso apice aristato-mucronato, margine integerrimo plano, chartacea, laevia, glaberrima, siccitate opaca, obscure viridia vel juniora subtus leviter rubescentia; costa gracillima, subtus vix prominula, supra tenuiter insculpta; nervi laterales tenuissimi, 5-6-jugi, acute adscendentes; nervi minores omnino immersis; petiolus 3-4 mm longus, gracillimus, glaber; stipulae triangulares, 2-3 mm longae, acutae, conspicue ochraceo-marginatae et brevissime fimbriatae. *Inflorescentiae* numerosae, axillares, multiflorae, plerumque mere masculae sed interdum flore singulo femineo comitatae, bracteis numerosis minutis brunneis scariosis confertis. *Flos* ♂ pedicello filiformi usque 6 mm longo glabro suffultus. *Sepala* 5, suborbicularia, 1.5-2 mm diametro, integra, membranacea, valde imbricata. *Disci glandulae* 5, cum sepalis alternantes, majusculae, subglobosae, valde lacunosae, interdum superne cuspidatae. *Stamina* 5, oppositisepala, libera, erecta, filamentis brevibus crassiusculis, antheris extrorsis ovoideis demum oblique deorsum spectantibus. *Flos* ♀ in inflorescentia semper solitarius, pedicello robustiore gestus primum vix 1 cm. longo statu fructifero usque 2.2 cm accrescente. *Sepala* 5, suborbicularia vel late spatulata, 2.5 mm longa et lata, breviter unguiculata, firme herbacea, glabra. *Discus* interrupte annularis, 0.5 mm altus, herbaceus vel submembranaceus, margine leviter erosulus. *Ovarium* subglobosum, 1.5 mm diametro, glabrum, in stylum robustum 0.5 mm longum desinens, stylo apice breviter 3-ramoso, ramis divaricatis truncatis. *Capsula* pedicello usque 2.2 cm longo sursum incrassato suffulta, depresso globosa, 6-7 mm diametro, 5-6 mm alta, laevis, glaber, stylo persistente. *Semina* triquetra, 3 mm longa, 2 mm crassa, laevia vel dorso levissime longitudinaliter striatula, ochracea, minute brunneo-notata.

QUEENSLAND. *Port Curtis District* — Bulburin Forest, 10 km E. of Builyan, 24° 31' S., 151° 28' E., Site No. 27A, 11.i.1975, A.C. Robinson 27A1 (holotype, BRI) (voucher for plant material collected in connection with rat-trapping).

The extent to which this plant mimics some of the smaller-leaved forms of *Sauropus macranthus* Hassk. is quite remarkable. The mimicry is not confined to the foliage but extends also to the conspicuous pale-margined stipules and the long-pedicelled female flowers and fruits with large persistent unguiculate sepals. But the male flowers are simple *Phyllanthus* flowers, with none of the specialisations of *Sauropus*, and the style-branches are extremely simple structures, not the coiled ramshorns of *Sauropus*.

I believe I am right in suggesting an affinity with the two New Guinea species mentioned above. (For an illustration of *P. caesius* see Hook. Icon. Pl. 38: t.3704 (1974)). There is much similarity in the type of venation, and the male flowers, apart from the free condition of the stamens, are almost identical. The large lacunose disk-glands recall those in many species of sect. *Nymania*. It seems surprising that a species with such northern affinities should occur so far south in Queensland.

The occurrence of *P. sauropodoides* and *P. brassii* (q.v.) in Bulburin State Forest suggests that the flora there may show peculiar features which would be worth closer investigation.

**Actephila Bl.**  
(P. & H. 36)

**Actephila sessilifolia** Benth., Fl. Austr. 6: 90 (1873); Bailey, Queensl. Fl. 5: 1414 (1902); Pax & Hoffm. in Engler, *Pflanzenreich* IV. 147. xv: 194 (1922).

QUEENSLAND. *North Kennedy District* — Seaview Range, 18° 55' S., 146° 10' E., alt. 915 m, 5.iv.1947, *Flecker* in N. Qld. Herb. 10880 (QRS); Lower western slopes of Mt. Dryander, 20° 15' S., 148° 33' E., rain-forest on soil derived from granite, alt. 250 m, 21.vii.1974, *Moriarty 1866* (QRS). *Port Curtis District* — "Shrub of 4-6 ft at the Caves Mountain, 5 miles west of Morinish", n.d., *Thozet s.n.* (MEL, **lectotype**, here chosen: K).

The two specimens from North Kennedy District cited above appear to be the only collections made of this very distinct species since it was first described. In October 1976 B. Hyland and the writer attempted to rediscover the plant on and around the Caves Mountain, north of Rockhampton, but without success. Some uncertainty attaches to the data on Thozet's label. He implies that the locality Morinish (which he elsewhere — e.g. in field note to *Croton acronychioides* F. Muell. — terms "Morinish Digging" and Bentham, l.c., erroneously cites as 'Morinisi') lies 5 miles (8 km) east of Caves Mountain, but no such place can be found in that area, whereas a locality Morinish is clearly marked on modern maps some 35 kilometres north-west of the Caves. It is possible that Thozet inadvertently wrote 'west' instead of 'east', or that 100 years ago there was in fact another Morinish to the east of Caves Mountain.

*Actephila sessilifolia* has a curiously disjunct distribution. It has only been collected at three isolated spots within its range from Caves Mountain to its northernmost locality (Seaview Range) some 685 kilometres north of Rockhampton.

**Actephila petiolaris** Benth., Fl. Austr. 6: 89 (1873); Bailey, Queensl. Fl. 5: 1414 (1902); Pax & Hoffm. in Engler, *Pflanzenreich* IV. 147. xv: 194 (1922); Airy Shaw in *Kew Bull.* 25: 498 (1971), in obs.

QUEENSLAND. *Cook District* — State Forest Reserve 675, Mulgrave Logging Area, 17° 05' S., 145° 40' E., rain-forest, alt. 160 m, small tree 5 m tall, 5.vi.1974, *Hyland 7243*; *Ibid.*, alt. 100 m, tree 10 cm d.b.h., nondescript bark, buttresses absent, blaze odour freshly shelled pcas, 25.xi.1976, *Hyland 3481-2-3* RFK; East Mulgrave Logging Area, alt. 100 m, small slender tree 6 m x 10 cm d.b.h., flower buds [♂] white, 22.xii.1976, *Hyland 9249*.

These collections, agreeing perfectly with the rather scrappy syntype material at Kew, are apparently the only collections of this scarce or extremely local species made since Dallachy obtained the type in the Rockingham Bay area over 100 years ago. They dispose of the tentative speculation that I expressed in 1971 (l.c.) that *A. petiolaris* might be a form of the variable *A. lindleyi* (Steud.) Airy Shaw. The broadly ovate, elliptic or obovate leaves, and especially the elongate petioles (up to 7.5 cm), are characteristic. Bentham found only 3 stamens in the flowers he dissected; in Hyland's recent material I found 4 or 5. Female flower and fruit are desiderata: Bentham described the female flowers from Dallachy's gatherings, but none survive in the Kew syntype, and there appear to be none in Hyland's material.

**Actephila foetida** Domin. See *Kew Bull.* 31: 363-364 (1976).

QUEENSLAND. *Cook District* — Harvey Creek, Russell River, 1887, *Sayer s.n.* (MEL).

This is the 'third gathering' of *A. foetida* referred to in *Kew Bull.*, l.c. It is actually the first known collection, from the type and only known locality, of this rare and unmistakable plant.

**Neoroepera** Muell. Arg. & F. Muell.  
(P. & H. 45)

**Neoroepera banksii** Benth., Fl. Austr. 6: 117 (1873); Bailey, Queensl. Fl. 5: 1425 (1902); Britten, Ill. Bot Cook Voy. Endeavour, 88, t.289 (1905).

QUEENSLAND (early collections). *Cook District* — Endeavour River, vii.1819, *Cunningham 291 & 292* (K,

type); Cape Sidmouth (approx. 14° 30' S.), no date or collector's name (MEL); Lizard Island, xii.1871, *Walter s.n.* (MEL); Cooktown, n.d. *Fitzalan s.n.* (MEL).

The distributions of, and the distinctions between, the two species of *Neoroepera* need further investigation, but I believe that Walter's Lizard Island specimen, referred by Benth. (l.c.) to *N. buxifolia* Muell. Arg. & F. Muell., belongs rather to *N. banksii* Benth. *N. buxifolia* is probably confined to a small area in Port Curtis District to the north-west of Rockhampton. Besides the type (Princhester Creek, *Bowman*) I have only seen the following specimen: Between Marlborough and Yaamba, common along creeks, small tree, flowers [♂] cream, 27.x.1937, *C.T. White 12095* (BRI, photo at K). *N. banksii* has been collected a number of times from the north of the Cape York Peninsula south to Cooktown.

The sterile specimens of '*Sersalisia obovata*', collected by *Cunningham* (no. 119) on the Endeavour River in June 1819 and referred by Benth. doubtfully to *N. buxifolia*, do not, I believe, belong to *Neoroepera* and are probably not euphorbiaceous at all. The petioles are appreciably longer than those of either species of *Neoroepera* (up to 4.5 mm, compared with 1-2 mm), and the lamina, when examined by transmitted light, shows a few small translucent gland-dots, mostly irregularly distributed, but occasionally grouped together near the apex of the leaf.

**Petalostigma F. Muell.**  
(P. & H. 49)

**Petalostigma banksii** Britten & S. Moore. See *Kew Bull.* 31: 369 (1976).

NORTHERN TERRITORY. Coburg Peninsula, 8 km SW of Danger Point, infrequent in groves in tall Eucalyptus forest, tree 3.5-4.5 m, trunk dark, tessellated, 23.vii.1961, *Chippendale 8284* (BRI).

QUEENSLAND. *Burke District* — Normantown, [c. 1867] *B. Gulliver s.n.* (MEL); 88 km N. of Hughenden, common on stony ridges, 11.ix.1937, *Brass & C.T. White 50* (BRI); 93 km SE of Burketown, 14.vii.1974, *Ollerenshaw P.O. 1412* (CBG 058086; BRI). *Cook District* — Silver Plains-Goanna Creek road, in tea-tree scrub, xi.1956, *Webb 3187* (BRI); Cooktown, in open forest on rocky hillsides, small irregular tree with very dark grey tessellated furrowed bark and rather sparse sometimes shapely green crown; fruit yellow, 31.vii.1943, *S.T. Blake 15079* (BRI), [Untypical; leaves up to 2.5 cm broad, mostly ± acute; ? tending towards *P. pubescens*]. *Mitchell District* — Alice River, 1896, *Miss May Dixon s.n.* (MEL).

**Petalostigma nummularium** Airy Shaw in *Kew Bull.* 31: 373 (1976).

NORTHERN TERRITORY. Bonney Creek, 8 km off Stuart Highway, in red sandy loam flat above creek, tree: 3.5 m, multitrunked [!], dark rough bark; leaves: upperside bright green, underside grey-green, hairy; stems: brown-hairy; flower: 4 greenish cream sepals, cream stamens; fruit: immature, green, hairy, gooseberry-like, 1.vii.1973, *Una Johnson 73/68* (NSW).

QUEENSLAND. *Maranoa District* — Property of A. Murray, Calabah, 75 miles [120 km] south-east (sphalm. 'south-west') of Charleville [Warrego District], Boatman road, mulga-box country, sandy soil, 28.iii.1962, *J. Ebersohn s.n.* (BRI).

**Petalostigma pachyphyllum** Airy Shaw in *Kew Bull.* 31: 372 (1976).

QUEENSLAND. *Leichhardt District* — Blackdown Tableland, 19 km SSE of Bluff, above North Scarp, in open Eucalypt forest on sandy soil with numerous rock outcrops, alt. 660 m, shrub to 1 m, fruit reddish-orange, 19.ix.1959, *R.W. Johnson 961* (MEL).

**Petalostigma pubescens** Domin. See *Kew Bull.* 31: 368 (1976); cf. George & Kenneally in Miles & Burbidge (ed.), *Biol. Surv. Prince Regent River Reserve, Wildlife Res. Bull. W. Aust.* 3: 47 (1975).

WESTERN AUSTRALIA (early collections). Prince Regent's River, 1891, *Bradshaw & Allen s.n.* (NSW); Fitzroy River, 1896-97, *Keartland s.n.* (Calvert Exped.) (NSW); Dillon's Springs, E. Kimberley, x.1906, *W.V. Fitzgerald s.n.* (NSW).

QUEENSLAND (early collections). *Burke District* — Scrub near Saxby River (SE of Normanton), tree, viii.1913, *Miss F. Sulman 8* (NSW); Woolgar River (N. of Richmond), viii.1915, *E.W. Bick s.n.* (NSW).

**Petalostigma quadriloculare** F. Muell. See *Kew Bull.* 31: 370 (1976).

A further obvious reason for typifying this species by Mueller's female material (cf. *Kew Bull.* 31: 366) is the fact that he not only called the genus '*Petalostigma*', from the female flowers, but named the species '*quadriloculare*', from the fruit.



WESTERN AUSTRALIA. "Mount Broome, W. Kimberley, May 1905, *W.V. Fitzgerald s.n.* (MEL). Shrub of 3 feet high." — The specimen of *P. humile* W.V. Fitzg. so labelled in the Melbourne Herbarium is probably part of the type collection, from the King River in E. Kimberley. The mistake in locality is possibly due to some confusion of labelling during the sorting of the material of Fitzgerald's two expeditions.

NORTHERN TERRITORY. Palmerston [Darwin], shrub springing in burnt ground, flowers yellow, n.d., *Rev. T.S. Lea s.n.* (MEL).

Add the following reference to the citations for *P. humile* W.V. Fitzgerald (synonym of *P. quadriloculare*): S. Moore in *J. Linn. Soc. Bot.* 45: 218 (1920).

***Petalostigma triloculare* Muell. Arg.** See *Kew Bull.* 31: 369 (1976).

QUEENSLAND. *Port Curtis District* — between Water Park Creek and The Peaks, 22° 45' S., 150° 45' E., dry sclerophyll forest, alt. 100 m, tree 13 m x 25 cm d.b.h., with a dark somewhat flaky and fissured bark, 7.x.1976, *Hyland 9065* (QRS); Junction of Manifold and Freshwater roads, 22° 40' S., 150° 45' E., dry sclerophyll forest, alt. 100 m, shrub or small tree with orange fruit, 6.x.1976, *Hyland 9060* (QRS).

These recent collections carry the distribution of *P. triloculare* some 370 kilometres north of its previously known most northerly station near Maryborough, thus more than doubling the latitudinal extent of its area. The 13-metre high tree was by far the tallest *Petalostigma* that I had ever seen.

### ***Austrobuxus* Miq. (P. & H. 52)**

***Austrobuxus nitidus* Miq.** See Airy Shaw in *Kew Bull.* 25: 506 (1971) & 29: 309 (1974) & in *Kew Bull. Addit. Ser.* IV: 43 (1975).

QUEENSLAND. *Cook District* — S.F.R. 143, North Mary L.A., 16° 30' S., 145° 15' E., alt. 1100 m, tree 30 m x 50 cm d.b.h., with a slightly flaky bark; fruit green, probably immature, 17.vii.1973, *Hyland 6740*; E/P 18, North Mary Logging Area, R 143, Mt. Lewis, 16° 30' S., 145° 16' E., rain-forest, alt. 1000 m, 10.x.1973, *Sanderson 472* (QRS); Mt. Lewis Road, 16° 34' S., 145° 11' E., tree 30 m high with gnarled bole 60 cm diameter, epicarp [of fruit] splitting at base and up the side leaving endocarp enclosing seeds; seeds with orange arillus, 31.viii.1957, *L.S. Smith 10095*; Mt. Lewis, 16° 35' S., 145° 15' E., rain-forest, alt. 1050 m, 21.xii.1967, *Hyland 1255* RFK; S.F.R. 143, South Mary L.A., 16° 35' S., 145° 15' E., rain-forest, alt. 900 m, 17.viii.1973, *Irvine 616*; S.F.R. 143, Carbine L.A., 16° 35' S., 143° 15' E., rain-forest, alt. 1200 m, tree 20 m x 30 cm d.b.h.o.b., with a flaky bark and slightly fluted stem, 18.xii.1974, *Hyland 7917*; State Forest Reserve 310, 17° 20' S., 145° 40' E., rain-forest, alt. 700 m, 24.ix.1973, *Dansie s.n.* (QRS); S.F.R. 310, Bora L.A., 17° 20' S., 145° 45' E., rain-forest, alt. 720 m, tree 25 m x 50 cm, with a fluted trunk and pink somewhat fibrous outer blaze, female tree, 8.x.1973, *Hyland 6917*; *Ibid.*, tree 20 m x 60 cm, with a fluted trunk and flaky bark, male tree, 8.x.1973, *Hyland 6918*; Swipers Logging Area, 17° 21' S., 145° 46' E., rain-forest, alt. 700 m, tree 23 m high x 75 cm d.b.h.; stem fluted; bark flaky; outer blaze pink, fibrous; inner blaze pink, fibrous, 27.vi.1972, *Risley 59*.

I cannot distinguish this plant from narrow-leaved forms of the common *A. nitidus* of Malaya, Sumatra and Borneo. The disjunction in distribution of nearly 3840 km between East Indonesian Borneo, the nearest otherwise known locality, and this North Queensland population is remarkable. It seems probable that the plant must occur in small quantity in the intervening area.

***Austrobuxus swainii* (de Beuzev. & C.T. White) Airy Shaw** in *Kew Bull.* 25: 508 (1971) & 29: 308 (1974), in clavi.

*Longetia swainii* de Beuzev. & C.T. White in *Proc. Linn. Soc. N.S.W.* 71: 236 (1947); Francis, *Aust. Rain-Forest Trees*, ed. 3, 230 (1970).

In my key to the species of *Austrobuxus* (1974, l.c.) I expressed doubt as to whether *A. swainii* was rightly referred to this genus. Having now examined isotype and other material of this species in the National Herbarium at Sydney (NSW), I am satisfied that the assignment is correct, although the crenate-dentate leaves are unique in the genus. This feature suggests comparison with *Choriceras tricornis* (Benth.) Airy Shaw and, less strongly, with *Dissiliaria muelleri* Baill. The bilocular ovary, however, and the seeds with a conspicuous pale fibrous finely lacinate aril (as in *Austrobuxus clusiaceus* (Baill.) Airy Shaw and *A. carunculatus* (Baill.) Airy Shaw) are characters at variance with both *Choriceras* and *Dissiliaria*. The 8-stamened male flowers can be compared with those of few-stamened New Caledonian species such as *A. depauperatus* (Baill.) Airy Shaw, *A. gynotrichus* (Guillaum.) Airy Shaw, *A. eugeniifolius* (Guillaum.) Airy Shaw, etc.

**Dissiliaria F. Muell. ex Benth.**  
(P. & H. 53)

**Dissiliaria laxinervis** Airy Shaw, sp. nov.

*D. baloghioidi* F. Muell. ex Benth. affinis, sed nervatione foliorum laxo subtus manifeste elevato distincta.  
TYPUS: Queensland, Hyland 2578 RFK (K, holotypus).

*Arbor* usque 25 m alta, anteridifera, fere glaberrima, ramulis junioribus laevibus vetustioribus lenticellis crebris ellipticis pustulosis. *Folia* opposita vel terna, elliptica vel late elliptica, usque 18 x 7 cm, basi cuneata vel (*L.S. Smith 14372*) rotundata, apice aut pari ratione angustata aut subrotundata, ipso apice semper obtuso, margine integro saepe undulato, coriacea, laevia, nitida, glaberrima, siccitate aut viridula aut (*Smith 14372*) brunnea; costa gracilis, utrinque prominens; nervi laterales gracillimi, 5-8-jugi, acute adscendentes, parum curvati, diffuse anastomosantes, supra immersi vel vix prominuli, subtus argute elevati; nervi minores laxe reticulati, supra obscuri, subtus permanifesti; petiolus 5-8 mm longus, glaber; stipulae interpetiolares, triangulares vel ellipticae 2-9 x 2-5 mm, acutae vel obtusae, caducae; alabastra axillaria parva, globosa, dense ferrugineo-tomentella. *Flores* et ♂ et ♀ ignoti. *Capsulae* in axillis per 1-4 fasciculatim gestae, pedicellis 1.5-4.5 cm longis rigidis sicut ramuli lenticellosis, subglobosae, 1.5 cm diametro, pericarpio crassiusculo ab endocarpio solubili tenuiter ochraceo-velutino. *Semina* (immatura) applanata, semi-orbicularia, 8 x 5 mm, laevissima, nitida, saturate castanea.

QUEENSLAND. *Cook District* — Claudie River, 12° 45' S., 143° 15' E., gallery rain-forest, alt. 80 m, tree 60 cm d.b.h., with a coarsely flaky bark, red heartwood and conspicuous buttresses, 29.vi.1972, Hyland 2578 RFK (type); Ibid., rain-forest, alt. 60 m, tree 25 m x 60 cm d.b.h., with a flaky bark and pink blaze, 22.ix.1976, Hyland 9028; Gap Creek, 15° 45' S., 145° 10' E., granite wash, alt. 30 m, 18.v.1969, *L.S. Smith 14372*; Ibid., 12 km N. of Aylton on Cooktown road, roadside remnant of lowland rain-forest, 15° 50' S., 145° 20' E., small tree, 4 m, fruit yellow-green with rusty tomentum, 23.vi.1973, Blaxell 1170.

This species is manifestly distinct from *D. baloghioides* in the lax venation of the leaves, which is sharply elevated on the lower surface. If further collections confirm the distinctness of the form from Gap Creek, with a rounded leaf-base, drying brown, it may deserve taxonomic recognition.

**Choriceras Baill.**  
(P. & H. 53/a)

**Choriceras majus** Airy Shaw, sp. nov.

*A. C. tricorni* (Benth.) Airy Shaw foliis multo majoribus et praesertim latoribus fere integris facile distinctum. TYPUS: Queensland, Hyland 9365 (K, holotypus; QRS, isotypus).

*Arbor* parva, ramulis teretibus 1-4 mm crassis, cortice pallido glabro, novellis minute adpresse puberulis. *Folia* opposita, ovata vel late elliptica, 7-14 cm longa, 3-7 cm lata, basi late cuneata usque rotundata, apice breviter subacuminata vel cuspidata vel raro rotundata, ipso apice obtuso rarius subacuto, margine integro vel obscurissime sinuato-denticulato anguste reflexo vel revoluta, chartacea vel vix tenuiter coriacea, laevia, opaca vel vix nitidula, utrinque primum minute dissite adpresse puberula, supra mox subtus tarde glabrescentia, superficie superiore sub lente minute granulata; costa mediocris, subtus prominens, supra latiuscule prominula; nervi laterales gracillimi, 8-10-jugi, patuli, utrinque inconspicue prominuli, prope marginem diffuse anastomosantes; nervi minores valde inconspicui; petiolus 7-10 mm longus, 1-2 mm crassus, primum minute puberulus, demum glabrescens; stipulae ad lineam transversam prominulam redactae. *Inflorescentiae* ♂ axillares (verosimiliter cymae congestae), multiflorae, perulis parvis convexis puberulis numerosis suffultae. *Pedicelli* filiformes, usque fere 1 cm longi, glabri. *Tepala* 5-6, obovata vel suborbicularia, 1.5-2 mm diametro, valde convexa, hyalino-membranacea, cremae, medio fusca. *Stamina* 5-6, 1-1.5 mm longa, e margine receptaculi exorta, antheris late ellipsoideis, receptaculo centrali elevato hemisphaerico spongioso longe piloso. *Pistil-lodium* nullum. *Inflorescentiae* ♀ axillares, plerumque biflorae, axi primaria gracili 3-12 mm longa minute puberula apice flores 2 oppositos bracteis subulatis 1.5 mm longis suffultos gerente. *Pedicelli* rhachi primaria crassiores, 3-4 mm longi, minutissime

puberuli. *Tepala* 3 + 3, ovario arcte adpressa; exteriora late ovata, 1.5-2 mm longa et lata, acuta, carinata, hyalino-herbacea, minute puberula, margine erosula; interiora multo minor, suborbicularia vel anguste ovata, vix 1 mm longa, apice obtuso vel rotundato. *Ovarium* (anthesi jam peracta) profunde tricocum, 3.5-4 mm longum et latum, minute adpresse puberulum, loculis ovoideis dimidio inferiore tantum connatis superne liberis cornutis in stigmata conspicua uncinata desinentibus. *Fructus* ignotus.

QUEENSLAND. *Cook District* — Portion 62 Alexandra, 16° 10' S., 145° 25' E., rain-forest, alt. 5 m, small tree with cream flowers [♂]; young leaves red, 19.xii.1972, *Hyland* 6612; T.R. 165, Pieter Botte L.A., 16° 06' S., 145° 23' E., rain-forest, alt. 450 m, small tree overhanging the creek, flowers [♀] cream, flowers in F.A.A., 1.vi.1977, *Hyland* 9365 (type).

This is a rain-forest counterpart of the closely related *A. tricornis*, a locally common species of sandy heaths, savanna forest, monsoon forest, etc., in the Northern Territory, north-east Queensland (S. to Rockingham Bay), and southern Papua. The only tangible differences between the two are the much greater size, and especially breadth, and practically obsolete toothings of the leaves. In floral characters they seem almost indistinguishable.

The foliage of *C. majus* bears an uncanny resemblance to that of certain species of *Palmeria* (Monimiaceae). The only certain point of distinction that I have found is the absence of minute translucent oil-dots in the leaves of the *Choriceras* when viewed by powerful transmitted light.

### *Cleistanthus* Hook.f.

(P. & H. 63)

*Cleistanthus myrianthus* (Hassk.) Kurz. See *Kew Bull.* 31: 378 (1976).

QUEENSLAND. (modern collections). *Cook District* — Bailey's Creek, north of Daintree River, rainfall 125" annual average, 1962, *L.S. Smith & Tracey* 6513 (BRI); Range just N. of the Daintree River, 16° 30' S., 145° 30' E., 11.x.1967, *Hyland* 1087 (BRI); Roaring Meg, 16° S., 145° 15' E., 16.iv.1969, *Hyland* 2218 (BRI); Half mile [0.8 km] W. of Cedar Bay, Bloomfield River area, rainfall estimated 1800 mm per annum, alt. 20 m, v.1969, *Webb & Tracey* 8985 (BRI); Oliver Creek, a tributary of Noah Creek, 16° 06' S., 145° 27' E., alt. under 100 m, 21.viii.1972, *Webb & Tracey* 10883 (BRI); Portion 62 Alexandra (Noah Creek), 16° 10' S., 145° 25' E., rain-forest, alt. 4 m, small tree 7 m tall, 10.v.1973, *Hyland* 6724 (BRI); T.R. 146, Fritz L.A. (Gap Creek), 15° 45' S., 145° 20' E., rain-forest, 25.vii.1973, alt. 60 m, small tree with reddish fruits, *Hyland* 6781 (BRI).

This common Malesian species appears to be confined in Australia to a relatively small area south of Cooktown.

*Cleistanthus dallachyanus* (Baill.) Baill. ex Benth., *Fl. Austr.* 6: 122 (1873); Bailey, *Queensl. Fl.* 5: 1412 (1902); Jabl. in Engler, *Pflanzenreich* IV. 147. viii: 36 (1915).

*Amanoa dallachyana* Baill. in *Adansonia* 6: 335 (1866). Syntypes: Rockhampton, 1862-63, *Dallachy* 17 (MEL); *Thozet* 337 (MEL); Mount Mueller & Port Denison, n.d., *Dallachy* s.n. (MEL).

QUEENSLAND. *Cook District* — New Holland, Endeavour River, 1770, *Banks & Solander* (MEL). *North Kennedy District* — Whitsunday Group, Hook Island, leaves stiff, dark green, pointed oval; flowers in small sprays, greenish yellow, small stars; buds velvety brown, viii.1971, *S. Webster* s.n. (BRI). *South Kennedy District* — Sarina, in rain-forest on river-bank in dark grey loam, alt. 15 m, tree about 6 m high, 14.i.1931, *Hubbard & Winders* 6509 (BRI).

The above records, taken together with the earlier ones from Rockhampton, the Herbert River, Northumberland and Cumberland Islands, suggest a preference for coastal or estuarine situations.

*Cleistanthus xerophilus* Domin. See *Kew Bull.* 31: 381 (1976).

QUEENSLAND. *Cook District* — Upper Massey Creek, in riverine rain-forest, 24 km a little S. of ENE of Coen, alt. 105 m, 11.x.1962, *L.S. Smith* 11772 (BRI); 2.5 km SE of Coen, on Port Stewart road, around rocky gully in hills, alt. 225 m, small tree 6 m high, 16.x.1962, *L.S. Smith* 11947 (BRI); Coen, in deciduous vine thickets on granite outcrops, 1962, *Webb & Tracey* 8017 (BRI); Nolan Creek, 16° 50' S., 144° 10' E., on the bank of an ephemeral creek in open riparian eucalypt forest, alt. 230 m, small shrubby tree 4.5 m tall, fruit green, 26.xii.1974, *Hyland* 7926 (BRI); *Ibid.*, 20.ii.1975, *Hyland* 8051 (BRI); Maytown Road (SW of Coktown), shrub to 3 m, 5.xi.1947, *S.E. Stephens* in *N. Qld. Nats. Club* 11830 (BRI).

Domin described his species from a small-leaved plant with leaves only 1-4.5 cm in length, but in individuals from more favourable habitats the leaves may be as much as 11 cm long and 4 cm broad.

**Cleistanthus (§Leiopyxis) peninsularis** Airy Shaw & Hyland, sp. nov.

*A. C. semi-opaco* F. Muell. ex Benth. indumento cinnamomeo potius quam ferrugineo, foliis supra multo minus nitentibus, floribus majoribus bene distinctus. TYPUS: Queensland, near Musgrave, Hyland 6927 (K, holotypus; QRS, isotypus).

*C. semiopacus* var. *curvaminis* Airy Shaw in *Kew Bull.* 31: 380 (1976).

*Frutex* vel *arbuscula* usque 10 m alta, ramulis gracilibus 1-2 mm crassis primum adpresse cinnamomeo-puberulis mox glabrescentibus. *Folia* anguste obovata vel oblonga, rarius elliptica, 5-11 cm longa et 2-4.6 cm lata, vel interdum (*L.S. Smith* 11973) 3.5-5.5 cm longa, 1-2 cm lata, basi cuneata usque rotundata, apice breviter acuminata vel cuspidata, ipso apice acuto vel obtuso, margine integro angustissime reflexo, chartacea, siccitate viridia, supra vix nitidula, parce evanido-albido-puberula, subtus opaca, persistenter adpresse minute albido-puberula; costa gracilis, subtus prominula, supra fere plana; nervi laterales gracillimi, 6-8-jugi, patuli vel acutius adscendentes, non nisi apicem folii versus manifeste anastomosantes; petiolus 5-8 mm longus, 1 mm crassus, primum cinnamomeo- vel ferrugineo-pubescent, mox glabrescent; stipulae oblongae, 2-3 mm longae, 1 mm latae, puberulae. *Inflorescentiae* axillares, glomerulis globosis multifloris multibracteatis 5-10 mm diametro conspicue cinnamomeo-sericeis. *Flos* ♂: calyx infundibuliformis, inferne in pedicellum 1.5 mm longum angustatus, totus 7 mm longus (pedicello incluso), extra longe cinnamomeo-sericeus, intus glaber, segmentis oblongis vel subulatis 3 mm longis, 1 mm latis (quinto saepe latiore) acutis; discus inconspicuus, calycis tubo arcte adhaerens, tenuis, brevissime lobulatus; petala valde varia, rhomboidea vel spatulata, apice acuta vel lobulata vel truncata, 1.5 mm longa; columna staminalis 2.5 mm longa, filamentis liberis patentibus 1.5 mm longis, antheris majusculis oblongis 2 mm longis apice acutis; pistillodium anguste ovoideum, triquetrum, puberulum, fere 2 mm longum, acutum. *Flos* ♀: calyx ovoideus, sessilis, 4-5 mm longus, extra longe cinnamomeo- vel ferrugineo-sericeus, segmentis triangulari-lanceolatis 3 mm longis acutis; petala rhomboidea, acuta, denticulata, 0.5 mm longa; discus exterior humilissimus, annularis; discus interior late cupularis, sed anteriorem brevissime tantum excedens, margine subintegro; ovarium globosum, 2 mm diametro, dense pilosum; styli 1 mm longi, fere usque ad medium bifidi, ramis brevibus divaricatis sursum applanatis et expansis vel brevissime bilobulatis. *Capsula* non visa.

NEW GUINEA. *Papua* — Dauan Island (politically part of Cook District, Queensland), Torres Strait, 9° 25' S., 142° 30' E., low vine-forest/woodland on tops of hills and in gullies, small tree or shrub, 31.vii.1975, *Cameron* 2267, 2282, 2285, 2289, 2294, 2303, 2323 (QRS); *Ibid.*, dominant tree in low forest, 6-8 m tall, lower leaves worn and reddish — deciduous?, 31.vii.1975, *Cameron* 2317 (QRS).

QUEENSLAND. *Cook District* — *Islands in the Torres Strait*: Banks (Mao) Island, 10° 10' S., 142° 15' E., road to Kubin, interior of island, closed forest, 24.ii.1975, *Cameron* 20605, 20627 (QRS); Thursday Island, 10° 35' S., 142° 15' E., 3.vii.1974, *Heatwole & Cameron* 66 (QRS); Hammond Island, 10° 35' S., 142° 10' E., 5.vii.1974, *Heatwole & Cameron* 184 (QRS); *Ibid.*, 6.vii.1974, *Heatwole & Cameron* 202 (QRS); Prince of Wales Island, 10° 45' S., 142° 15' E., SE side, opposite Packe Island, closed forest, 16.ii.1975, *Cameron* 20105, 20106 (QRS); Prince of Wales Island, Cox's Beach, closed forest, tree, 13.ii.1975, *Cameron* 20143, 20171, 20196 (QRS); Prince of Wales Island, Big Creek, closed forest, soil rocky, understorey shrub, 11.ii.1975, *Cameron* 20214 (QRS); Prince of Wales Island, creek bank in savannah woodland, 13.ii.1975, *Cameron* 20286 (QRS). *Cook District* — *Cape York Peninsula*: Between Portland Roads and Iron Range, 12° 40' S., 143° 25' E., dry rain-forest — monsoon forest, alt. 60 m, tree 20 cm d.b.h., 4.vii.1972, *Hyland* 2616 RFK (QRS, K); The Bend, 2 miles NNW of Coen, on banks of Coen River, alt. 210 m, 16.x.1962, *L. S. Smith* 11973, (type of *C. semi-opacus* var. *curvaminis* Airy Shaw), (BRI; K); Timber Reserve 14 (Rocky River Catchment), 13° 50' S., 143° 25' E., dry rain-forest, alt. 150 m, small tree 10 m tall, with flaky bark, 10.ix.1973, *Hyland* 6845 (QRS, K); Few miles north of Musgrave on the Peninsular Road, 14° 40' S., 143° 30' E., riparian forest, alt. 75 m, small short-boled tree 10 m x 30 cm d.b.h., with a flaky bark; buds, flowers and fruits in F.A.A., *Hyland* 6927 (holotype, K; isotype, QRS).

The duller or less conspicuously shining upper surface of the leaves, the paler, cinnamomeous rather than ferrugineous indumentum, and the considerably larger flowers, are the distinguishing marks of this species in relation to *C. semi-opacus*. On sterile branches, in material from the Torres Strait (e.g. *Cameron* 20605, 20171), the leaves may reach much larger dimensions, up to 17 x 8 cm, with a slightly cordate base. As the species

occurs commonly, even to the extent of dominance, on Dauan Island, only a few kilometres off the coast of Papua, it is virtually certain that it must occur also on the adjacent mainland

**Bridelia Willd.**  
(P. & H. 65)

**Bridelia penangiana** Hook.f. See *Kew Bull.* 31: 382 (1976).

QUEENSLAND (early collections). *Cook District* — Mossman's River, 40 ft, 1886, *Sayer 178* (MEL, BRI). *North Kennedy District* — Herbert River ('No. X'), n.d., *Dellachy* (MEL); Murray River, small straggling tree with small red fruit, no flower, 4.xii.1866, *Dallachy* (MEL); Johnstone River, n.d., *H.G. Ladbroke 142* (BRI).

QUEENSLAND (modern collections). *Cook District* — Bailey's Creek area,  $\frac{1}{4}$  mile [0.4 km] E. of sawmill (7½ miles [12 km] ENE of Daintree), in somewhat swampy lowland rain-forest on grey soil, alt. 15 m, small tree 3 m high; trunk 1.5 in [3.75 cm] in diameter, with a few sparse spines; outer bark greyish; inner bark cream, oxidizing to a pale salmon colour, 2.x.1962, *L.S. Smith 11565* (BRI); Little Mulgrave, tree 12 m, 0.3 m d.b.h., 17° 08' S., 145° 42' E., 29.i.1954, *K.J. White 54/354 (677)* (BRI); Cucania, 17° 14' S., 145° 55' E., tree to 15 m, 30.viii.1954, *L.S. Smith 5319* (BRI); Bingil Bay (NE of Tully), 17° 52' S., 146° 06' E., on creek bank, small tree with somewhat glaucous leaves; leaves much paler beneath, 2.xi.1951, *L.S. Smith 4912* (BRI).

It is strange that *Dallachy's* records were not cited by *Bentham* (*Flora Australiensis*, 1873). The remaining records help to fill in the gap between the localities of *Claudie River* and *Mission Beach*, cited by me in 1976 (l.c.).

*Bridelia phyllanthoides* W.V. Fitzg. = **B. tomentosa** Bl. var. *tomentosa*; vide infra.

**Bridelia tomentosa** Bl. See *Kew Bull.* 31: 382 (1976).

*B. phyllanthoides* W.V. Fitzg. in *J. & Proc. Roy. Soc. W. Aust.* 3: 163 (1918), *synon. nov.* Type: W. Australia, base of Mt. Broome, 1905, *Fitzgerald 823* (NSW).

var. **tomentosa**

QUEENSLAND. *Cook District* — First large granite hill SE of Almaden on Petford Road, 17° 20' S., 144° 40' E., open forest, alt. 560 m, shrub 1-2 m tall growing among granite boulders, 30.xii.1974, *Hyland 7934* (BRI).

*Bentham's* record (*Fl. Austr.* 6: 120 (1873)) of this species from the *Port Curtis District: Rockhampton, O'Shanesy*, needs confirmation. I have seen no modern material from so far south.

var. **glabrifolia** (Merr.) *Airy Shaw* in *Kew Bull.* 31: 383 (1976). Additional early collections are:

WESTERN AUSTRALIA *Beagle Bay* (Dampier Land), 1869, *All. Hughan s.n.* (MEL); *Roebuck Bay*, iii.1890, *Tepper jun. 122* (MEL.); *Prince Regent River*, 1891, *Bradshaw & Allen s.n.* (MEL).

NORTHERN TERRITORY *Timber Creek*, v.1856, *Mueller* (MEL); *Victoria River*, near *Stokes & Fitzroy Range*, on rocky declivities, vi.1856, *Mueller* (MEL); *Port Darwin*, 1884, *Holtze 445* (MEL).

QUEENSLAND. *Cook District* — *Endeavour River*, 1883 & 1884, *Persieh s.n.* (MEL).

**Croton L.**  
(P. & H. 66)

**Croton acronychioides** F. Muell., *Fragm. Phytogr. Austr.* 4: 142 (1864); *Baill.* in *Adansonia* 6: 300 (1866); *Benth.*, *Fl. Austr.* 6: 127 (1873); *Bailey*, *Queensl. Fl.* 5: 1437 (1902); *Francis*, *Aust. Rain-Forest Trees*, ed. 3, 227 (1970). *Syntypes*: *Fitzroy River*, nr. *Rockhampton, Thozet*; *Broad Sound, Bowman*.

*C. affinis* *Maid. & R.T. Baker* in *Proc. Linn. Soc. N.S.W.* 11, 9: 160, t. 12 (1894); *Francis*, l.c., 230 (1970); *synon. nov.* Type: New South Wales, near *Tintenbar, Richmond River*, viii.1893, *Bäuerlen s.n.*

QUEENSLAND (early collection). *Port Curtis District* — *Rockhampton area*, *Morinish Digging*, tree 10-25 ft high; thick, corky, longitudinally fissured bark, like in some *Solaneae*, n.d., *Thozet 476* (MEL).

NEW SOUTH WALES *Tintenbar*, shrub or small tree 8-15 ft high, x.1891, *Maiden 525* (MEL) — *topotype* of *C. affinis*.

I was in error in 1976 (*Kew Bull.* 31: 386) in equating *C. affinis* with *C. verreauxii*

Baill. *C. affinis* almost certainly represents a form of *C. acronychioides* F. Muell. and a southerly extension of range for that species.

***Croton argyratus* Bl.** See *Kew Bull.* 31: 385 (1976).

NORTHERN TERRITORY. Unlocalised, but doubtless from Darwin or neighbourhood, shrub, 1891, *Maurice Holtze* 1233 (MEL); (In a copy of Benthams, (Flora Australiensis, 1873) in the Melbourne Herbarium the following note has been pencilled by Mueller against the description of *Croton schultzii* Benth.: "In specimens from Holtze the ♀ pedic. — 1" long. Leaves partly cordate or ovate or orbic."); East Point, Darwin, in monsoon forest, shrub 1 m, 14.xi.1967, *Byrnes* NB284 (NT 14345).

The plant was also noted on Elcho Island in July 1975, as a shrub of the deciduous vine thicket, by Dunlop, Latz & Maconochie (*N. Terr. Bot. Bull.* 1: 21 (1976) as *C. schultzii* Benth.). As, however, it was sterile, it was not collected.

The above occurrences seem to dispose of my surmise (*Kew Bull.* l.c.) that the specimen collected at Darwin in 1870 by *Schultz* (609) might have been a casual port introduction. The sparse isolated population on Elcho Island, northern Arnhem Land, appears to represent an extreme eastern outlier of the otherwise almost continuous distribution of *C. argyratus*, extending from South-East Asia to Bali and the Moluccas.

Holtze's material agrees well with *Schultz*'s, but is considerably more ample. It falls well within the ambit of the variable *C. argyratus*.

***Croton armstrongii* S. Moore** in *J. Linn. Soc. Bot.* 45: 219 (1920). Type: Port Essington, *Armstrong s.n.* (BM).

*C. habrophyllus* Airy Shaw in *Kew Bull.* 31: 386 (1976), *synon. nov.* Type: Port Darwin, *Schultz* 680 (K).

NORTHERN TERRITORY. Port Darwin, 1882, *Holtze* 40 (MEL); 1883, *Holtze* 322, 370 (MEL); 1886, *Tenison-Woods & Holtze* 40, 592 (MEL); Elizabeth Creek, 1885, *Holtze* 592 (MEL); Sine loc., 1891, *Holtze s.n.* (MEL); Melville Island, semi-evergreen vine forest, v.1966, *Stocker s.n.* (BRI); Wessel Is. 11° 11' S., 136° 44' E., rare on stable coastal dunes, shrub to 1.5 m, 28.ix.1972, *Latz* 3289 (BRI).

It is regretted that Moore's 1920 paper was overlooked by me when describing *Croton habrophyllus*, as also by Chippendale when listing the plants of the Northern Territory in *Proc. Linn. Soc. N.S.W.* 96: 207-267 (1972).

*Croton armstrongii* is apparently scattered widely but thinly over the northern part of Arnhem Land and adjoining islands. Though collected by Latz in the Wessel Islands in 1972 (see above), it was not noted by Dunlop, Latz & Maconochie in their account of the plants of Elcho Island (*N. Terr. Bot. Bull.* 1: 21 (1976)). The specimen *Byrnes* 2833, from Cannon Hill, to which I drew attention in 1976 as being somewhat aberrant, must be excluded from *C. armstrongii*. The taxon it represents has now been re-collected and is described below (p. 000) as a new species, *C. byrnesii*.

***Croton brachypus* Airy Shaw, sp. nov.**

*C. triacro* F. Muell. affinis, sed petiolis fere duplo brevioribus praesertim differt. TYPUS: Queensland, Tozer Range, 1948, *Brass* 19462 (K, holotypus).

*C. mirus* sec. Airy Shaw in *Kew Bull.* 31: 385 (1976), quoad *Brass* 19462 tantum, non Domin.

*Frutex* vel *arbor* usque 4 m alta, novellis et inflorescentiis parce lepidotulis, ceterum fere glabra. *Folia* cuneato-obovata, 5-17 cm longa, 2.5-6 cm lata, basi plerumque sensim cuneato-angustata, ipsa basi anguste rotundata vel cordatula, apice cito contracta et breviter acuminata vel cuspidata, ipso apice acuto vel obtuso, margine levissime repando-sinuato vel subintegro, chartacea vel vix tenuiter coriacea, laevia, matura fere glaberrima, siccitate viridia, subtus pallidiora, ima basi glandulis binis minimis e facie prominentibus aucta; costa subtus prominens, supra fere plana; nervi laterales tenuissimi, 7-9-jugi, late patuli, subtus et supra tenerrime sed argute prominuli, arcuato-anastomosantes; nervi minores fere invisibiles, laxissimi; petiolus 2-5 mm longus, parce lepidotulus; stipulae minutissimae vel obsoletae. *Inflorescentiae* terminales, 3-5 cm longae, androgynae, parce lepidotulae. *Flos* ♂ (alabastro juniore) 2 mm pedicellatus. *Sepala* parciissime stellato-lepidota. *Petala* spatulata. *Stamina* 10-12, basi vix pilosa. *Flos* ♀ brevissime pedicellatus. *Sepala* ovato-oblonga, 2 mm longa, acuta, parciissime stellato-lepidotula. *Petala* 0. *Ovarium* depresso



suborbiculare, 1.5 mm diametro, densissime albo-lepidotulum; styli 2 mm longi, fere usque ad basin bifidi, segmentis linearibus acutis glabris. *Capsula* integra non visa, valvis delapsis 6-7 mm longis parcesissime lepidotulis; semina latissime ellipsoidea, 4-5 mm longa, fere 4 mm lata, 3 mm crassa, laevia, castanea vel fusco-badia, lineis brevibus ochraceis longitudinaliter marmorata.

QUEENSLAND. *Cook District* — Puffdellooney Ridge, 12° 45' S., 143° 13' E., heath scrub, alt. 360 m, shrub 1.6 m high, small white flowers, 3.vii.1972, *Irvine 249* (QRS); Lower northern slopes of Mt. Tozer, 12° 45' S., 143° 15' E., dry rain-forest, alt. 200 m, shrub, 30.vi.1972, *Dockrill 441* (QRS); Tozer Range, 0.8 km east of Mt. Tozer, a characteristic species of rain-forest undergrowth, alt. 425 m, tree 3-4 m tall, leaves smooth and shining much paler below, flowers white, 6.vii.1948, *Brass 19462* (K, holotype). Lankelly Creek, on western fall of Mellwraith Range, approx. 13° 55' S., 143° 15' E., semi-deciduous mesophyll vine-forest along stream, on alluvial soils derived from a mixture of granite and metamorphic rocks, some sclerophyll emergents — *Melaleuca argentea* and *Eucalyptus pellita*, permanent waterhole at this point, alt. 200 m, x.1969, *Webb & Tracey 9625* (BRI).

This plant from the Cape York Peninsula is closely related to *C. triacros*, of the Atherton Tableland and Rockingham Bay region, but differs in its consistently and conspicuously short petioles.

***Croton byrnesii* Airy Shaw, sp. nov.**

*C. armstrongii* S. Moore arcte affinis, sed statu maturo glabritie fere tota, stipulis magis evolutis, et glandulis petiolaribus usque 1 mm a basi laminae semotis satis distinctus. TYPUS: Northern Territory, Cannon Hill, *Byrnes 2833* (DNA, holotypus; BRI, NT, K, isotypus).

*Frutex* vel *arbor* 2-4 m alta, habitu gracili patente, novellis et inflorescentiis parcesissime stellato-lepidotulis exceptis fere glaberrima, ramulis teretibus 2-4 mm crassis, cortice brunnescente vel cinereo. *Folia* ovata vel interdum elliptica, 6-10(-15) cm longa, 2-6(-9) cm lata, basi rotundata (raro levissime cordata vel latissime cuneata), apice sensim angustata vel breviter acuminata, ipso apice insigniter obtuso (raro acuto), margine leviter crenato vel subserrato vel rarius subintegro, membranacea, laevia, nisi valde juvenilia glaberrima, siccitate viridia, opaca; costa gracilis, subtus prominula, supra fere plana; nervi laterales gracillimi, circiter 8-jugi, patuli, subrecti, prope marginem curvati et diffuse anastomosantes; nervi minores tenuissimi, laxi; petiolus gracillimus, 1-3(-5) cm longus, vix 1 mm crassus, glaberrimus, apice glandulis binis breviter vel longe stipitatis usque 1 mm a basi laminae (vel interdum juxta laminam) sitis ornatus; stipulae lineares, usque 1.5 mm longae, caducae. *Inflorescentiae* terminales, 7-15 cm longae, mixtae, parce, stellato-lepidotulae, laxae multiflorae, bracteis minutis ovatis acutis ciliatis, fasciculis paucivel multifloris. *Flos* ♂ pedicello tenui 3-6 mm longo parce stellato suffultus. *Sepala* oblongo-ovata, 2-3 mm longa, 1-1.5 mm lata, acuta apice minute albo-pilosula, extra sub ipso apice callo minuto rubido ornata, crebriusculis translucido-glandulosa. *Petala* 5, linearia, 3 mm longa, apice densiuscule albo-pilosula. *Disci glandulae* 5, sepalis oppositae, transversae, carnosulae. *Stamina* 8-10, e fundo tenuiter longe piloso exorta, 3 mm longa, antheris oblongis. *Flos* ♀ pedicello robustiore ei masculi fere aequilongo parce stellato-lepidotulo suffultus. *Sepala* ovato-oblonga, 3 mm longa, 1.5 mm lata, apice ut in masculis. *Petala* deficientia. *Disci glandulae* fere ut in flore ♂. *Ovarium* 2 mm diametro, 1 mm altum, trilobum, dense stellato-pilosum; styli a basi liberi, divaricati, rigidi, appianati, sulco mediano percursi, superne bifidi, ramulis quasi tortis vel sigmoideis vel truncatis. *Capsula* tricocca, dissite albido-stellato-lepidotula, 8-9 mm diametro, 5-6 mm alta, sepalis fusco-brunneis revolutis persistentibus; semina brevissime oblongo-globosa, fere 4 mm longa, fere 3 mm crassa, utrinque rotundata et minute apiculata, laevissima, ochraceo-brunnea, immaculata.

NORTHERN TERRITORY. Cannon Hill, base of sandstone cliff, shrub c. 2 m high, 18.xii.1972, *Byrnes 2833* (DNA 5663, holotype; BRI, NT, K, isotypes); 1 mile [1.6 km] SW Cannon Hill, broadleaf scrub associated with small sandstone outcrop, spreading tree 4 m high, bark smooth mid-grey, fruit pale green, 1.ii.1973, *Martensz & Schodde AE648* (NT 38582); 2½ miles [4 km] N. of Cannon Hill Airstrip, monsoon rain-forest, small tree 2.4 m high, fruit green, 9.ii.1973, *Martensz AE812* (NT 38652, DNA 6200); Cannon Hill, 12° 22' S., 132° 56' E., at base of sandstone outcrop, sandy soil, small tree, xi.1976, *G. Miles s.n.* (DNA, K); East Alligator River, 12° 29' S., 133° 03' E., sandy soil, edge of creek with *Tristania lactiflua*, slender tree 3 m high, wood aromatic, 15.ii.1973, *Dunlop 3235* (NT 41542, DNA 7741).

When describing *Croton habrophyllus* (now reduced to *C. armstrongii* — see page

224) in 1976, I referred to *Byrnes* 2833 as possibly representing a slightly divergent local population of that species. Having now examined further collections of the *Byrnes* entity from the Cannon Hill area, and having seen both it and typical *C. habrophyllus* in the field, I am satisfied that it merits taxonomic recognition. It represents yet another micro-species in the critical section *Gymnocroton*. The most obvious feature is the almost complete glabrescence of the plant (except when very young). The apical petiolar glands are variable, but when long-stipitate and well distant from the base of the lamina they are striking. Further gatherings must show whether other characters (e.g. staminal number) show constant differences.

***Croton capitis-york* Airy Shaw, sp. nov.**

*C. wassi-kussae* Croiz. et *C. insulari* Baill. affinis, sed floribus ♂ sessilibus vel subsessilibus differt., a *C. insulari* praeterea foliis plerumque majoribus et tenerioribus distinctus. TYPUS: Queensland, Silver Plains Holding, 1973, *Stocker* 1077 (QRS, holotypus).

*Frutex* 1.5-3.5 m altus, ramulis teretibus laevibus 2-4 mm crassis dense minute ochraceo-lepidotis raro patenti-pilosulis. *Folia* elliptica usque fere oblonga, 5-16 cm longa, 4-6 cm lata, basi rotundata vel late cuneata, apice breviter acuminata vel abrupte obtuse cuspidata, ipso apice obtuso vel interdum acuto, margine integro vel obscure sinuato anguste reflexo vel rarius plano, tenuiter vel firme chartacea, siccitate viridula vel brunnescentia, supra dissite ochraceo-stellato-lepidotula; costa gracilis, supra fere plana, subtus prominens; nervi primarii laterales gracillimi, 8-11-jugi, late patuli, prope marginem arcuato-anastomosantes; nervi minores tenuissimi, aut primariis sub-parallelis aut laxe reticulati; petiolus gracilis, 1-5 cm longus, 1 mm crassus, supra alte canaliculatus, dense ochraceo-lepidotulus, apice glandulas binas laterales conspicuas breviter stipitatas gerens; stipulae non visae, forsitan obsoletae. *Inflorescentiae* (juniores tantum visae) terminales, interruptae spicatae, usque 8 cm longae, dimidio inferiore nudae vel usque ad basin floriferae, rhachi pro rata robusta dense minute lepidotula. *Flores* alabastro tantum visi: *masculi* sepalis 5 petalis 5 spatulatis staminibus circiter 10, *feminei* sepalis 5 crassiusculis petalis 5 vestigialibus minutissimis triangularibus fimbriatis ovario triloculari dense piloso stylis 3 bis bifidis instructi.

QUEENSLAND. Cook District — Bamaga Mission, 11.2 km SW of Cape York, east to mill and beyond, 11° 1' S., 142° 3' E., stony red hill, shrub 0.9-3.6 m high, 24.x.1965, *L.S. Smith* 12393; 8 km N. of crossing on Massey Creek, on road between Silver Plains Station and Rocky River, 13° 50' S., 143° 29' E., in evergreen vine thicket 5-6 m with emergents to 15 m usually also evergreen, notably *Eugenia banksii* & *Eugenia* sp. (nov.?) but an occasional deciduous species, notably *Terminalia sericocarpa*, 'soil' is fine white sand with dark stained topsoil, alt. 70 m, x.1969, *Webb & Tracey* 9740 (NSW); Temple Bay Yards, 12° 20' S., 143° 05' E., monsoon forest, alt. 40 m, 17.ix.1976, *Hyland* 8971 (QRS); Hann Creek Watershed, 12° 27' S., 142° 56' E., monsoon forest, alt. 150 m, shrub 4 m tall, 19.ix.1976, *Hyland* 9021 (QRS, K); West Claudie River, 12° 45' S., 143° 15' E., dry rain-forest, alt. 100 m, shrub 2 m tall, 29.vi.1972, *Hyland* 6170 (QRS, K); Silver Plains Holding, between Rocky River and Massey Creek, 13° 40' S., 143° 28' E., dry rain-forest, bush 1.5 m high, 13.ix.1973, *Stocker* 1077 (holotype, QRS).

var. ***pilosus*** Airy Shaw, var. nov.

Ramulis petiolis costa nervis inflorescentiis patentim pilosis distincta. TYPUS: Queensland, Temple Bay Outstation, 1976, *Hyland* 8995 (QRS, holotypus).

QUEENSLAND. Cook District — Olive River, 12° 10' S., 143° 05' E., low forest/heath, alt. 10 m, shrub 1-2 m tall, 13.ix.1974, *Hyland* 7449 (QRS); 2 km south of Temple Bay Outstation, 12° 22' S., 143° 05' E., vine thicket, alt. 20 m, shrub 10 m tall, 17.ix.1976, *Hyland* 8995 (holotype, QRS).

The peltate scales of this plant give a pale green sheen to the lower surface of the leaves, without the pinkish tinge that is usually present in *C. insularis*. The leaves are also larger and thinner in texture than in that species. The variety *pilosus* seems to make an approach towards *C. densivestitus* White & Francis (*C. pubens* Domin), but in that species the hairs are strictly fasciculate, without any lepidote base. It is probably even closer to *C. wassi-kussae* var. *stockeri* (p. 229, below) which has a very dense tomentose indumentum arising out of a dense lepidote covering. The var. *pilosus* is, in fact, somewhat intermediate between *C. wassi-kussae* var. *stockeri* and typical *C. capitis-york*, and it is perhaps significant that the two last-named taxa were collected by G.C. Stocker on the same day, within a short distance of each other (*Stocker* 1076 & 1077). The *Croton* populations in the area concerned would repay closer investigation.



***Croton densivestitus* White & Francis. See *Kew Bull.* 31: 385 (1976).**

QUEENSLAND. (early collections). *Cook District* — Harvey's Creek, Russell River, 1886, 1887, *Sayer* (MEL); *Ibid.*, 1889, *F.M. Bailey* (MEL, type!); *Ibid.*, 1892, *S. Johnson* (MEL).

***Croton dockrillii* Airy Shaw, sp. nov.**

Ab affini *C. armstrongii* S. Moore foliis angustioribus ellipticis longiuscule acuminatis, margine obscure sinuato- vel repando-dentato saepe conspicue reflexo vel revoluta manifeste recedit. TYPUS: Queensland, Alligator Creek, 1972, *Dockrill* 589 (QRS, holotypus).

*Frutex* 2-3 m altus, ut videtur laxis, ramulis teretibus 2-3 mm crassis, cortice laevi pallido juniore albido-stellato-pubescente demum glabro. *Folia* elliptica, 5-15 cm longa, 2-5.5 cm lata, basi late cuneata vel anguste rotundata, apice sensim (rarius subabrupte) longiuscule acuminata, ipso apice acuto vel obtuso, margine obscure sinuato- vel repando-dentato saepe conspicue reflexo vel revoluta, tenuiter chartacea vel submembranacea, supra glabra, subtus glabrescentia vel parce stellato-lepidota (juniora supra parcesissime subtus dissite stellata), siccitate laete viridia vel ochracea; costa gracilis, subtus prominens, supra prominula; nervi laterales gracillimi, 8-10-jugi, patuli, marginem versus anastomosantes, infimi (basales) arcte adscendentes; petiolus gracilis, 1-3.5 cm longus, 1 mm crassus, apice glandulas binas parvas laterales breviter vel longe stipitatas gerens; stipulae anguste subulatae, 2-4 mm longae, acutae, dense albido-stellatae, citissime caducae. *Inflorescentiae* terminales, bisexuales, 1-5 cm longae, rhachi parce albido-stellata, bracteae subulatis 1-2 mm longis. *Flores* ♂ in parte superiore evoluti, pedicellis gracilibus 2-3 mm longis parce albido-stellatis. *Sepala* 5, elliptica, 2 mm longa, 1 mm lata, acuta, extra parce stellata, apice pilosula. *Petala* 5, anguste spatulata, 2-2.5 mm longa, 0.5 mm lata, apice subobtusata, densiuscule pilosa, saepe revoluta. *Disci glandulae* subglobosae. *Stamina* 11-13, 2-4 mm longa, filamentis glabris e fundo dense lanato exortis. *Flores* ♀ pauciores, plerumque ad basin, rarius per dimidium inferius inflorescentiae exorti. *Pedicellus* 1-1.5 mm longus, crassiusculus, stellatus. *Sepala* 5, ovato-oblonga, 3-3.5 mm longa, 1.5-2 mm lata, subacuta, dorso parce albido-stellata, apice breviter pilosula. *Petala* 0. *Discus* annularis, humillimus. *Ovarium* globosum, 2 mm diametro, dense stellato-tomentosum, stylis basi brevissime connatis in segmenta 2 linearia acuta 5 mm longa glabra alte divisus. *Capsula* immatura 5-6 mm diametro, pilis stellatis minutis numerosis cum paucis majoribus conspersa. *Semina* ignota.

QUEENSLAND. *Cook District* — Galloway's Creek, Bamaga, littoral vine woodland, small tree, v. 1962, *Webb & Tracey* 6083 (BRI); Portland Roads, 12° 35' S., 143° 24' E., rain-forest near beach, alt. 20 m, flowers white, 10.iv.1944, *Flecker* 8507 (QRS); Alligator Creek, 12° 35' S., 143° 20' E., riparian rain-forest, alt. 60 m, shrub 3 m high, flowers cream, fruits green, flowers in F.A.A., 14.x.1972, *Dockrill* 589 (QRS, holotype); Iron Range, ix.1962, *Volck* 2418 (BRI); Claudie River, 12° 45' S., 143° 15' E., 24.x.1973, wilding transplant, 70 cm tall, flowers [♂] pale greenish, perianth with conspicuous white anthers that produce dominant colour of flower, cultivated as a pot plant in glasshouse at Forestry & Timber Bureau, Atherton, 5.ix.1974, *Dockrill* 844, & 14.i.1975, *Irvine* 1115 (QRS); Rocky River, 13° 50' S., 143° 25' E., dry rainforest, shrub 2-3 m tall, with all-white flowers, 6.ix.1973, alt. 75 m, *Hyland* 6814 (QRS).

This is rather closely related to *C. armstrongii* S. Moore (*C. habrophyllus* Airy Shaw), a thin-leaved species from the Northern Territory, but differs clearly in the narrower and more elongate outline of the leaves, which are often conspicuously acuminate, and especially in the more distantly and shallowly slightly repand-denticulate leaf-margin, which is usually somewhat undulate or sinuate and conspicuously reflexed or revolute. The basal glands are sometimes notably stipitate. In *C. armstrongii* the leaf-base is broadly rounded or cordate, and the margin is flat, and crenate or closely serrate-crenulate.

***Croton magneticus* Airy Shaw, sp. nov.**

*C. pilophoro* Airy Shaw (novoguineensi) arcte affinis, a quo stylis linearibus foliis minoribus inflorescentiis densifloris imprimis differt; nulli ali specie australiensi manifeste affinis, nisi forsan *C. wassi-kussae* var. *stockeri* Airy Shaw, a quo pube ramulorum multo breviora demum obsoleta, pilis erectis nullis, foliis oblongo-ellipticis 1.5-4 cm tantum latis basi rotundatis (raro angustissime cordatis), nervis supra prominulis nec insculptis, inflorescentiis densifloris nec interruptis inter alia abunde discrepat. TYPUS: Queensland, Magnetic Island, 1938, *Goy* 329 (BRI, holotypus).

*Frutex* incomptus, statura ignota, ramulis divaricatis inferne nudis 2-4 mm crassis primum dense brevissime fulvo-stellato-tomentellis demum glabrescentibus, cortice

ruguloso lenticellis parvis prominulis notato. *Folia* apicem ramulorum versus conferta, oblongo-elliptica, 3-10 cm longa, 1.5-4 cm lata, basi rotundata val raro angustissime cordata, apice rotundata vel obtusa vel interdum subacuta, margine plano manifeste leviter indentato-crenato, sinubus glandulam parvam stipitatam deorsum spectantem saepe gerentibus, chartacea, siccitate supra fusco-brunnescentia, subtus pallida vel cinerascens, supra pilis dissitis minutissimis fasciculato-stellatis instructa, subtus pilis minutis fasciculatis creberrimis albidis fere contiguis dense induta, pilis majoribus ochraceis hinc inde interspersis; costa modice gracilis, subtus prominens, supra vix prominula; nervi laterales gracillimi, 6-8-jugi, patuli, haud manifeste anastomosantes; petiolus 5-15 mm longus, gracilis, dense fulvo-stellato-tomentellus, glandulis solitis apicalibus stipitatis minimis et inconspicuis vel saepe nullis; stipulae obsoletae vel pube stellato celatae. *Inflorescentiae* androgynae, densiflorae, 6-8 cm longae, apice interdum cernua, rhachi dense minute albido-stellato-piloso. *Bracteae* 1 mm longae, patentes, brunneo-pubescentes. *Flos* ♂ pedicello 2 mm longo suffultus. *Sepala* 5, ovata, 2.5 mm longa, fere 2 mm lata, subacuta, membranacea, dorso albido- et rufo-stellata, intus glabra. *Petala* 5, spatulata, fere 3 mm longa, tenerrima, margine lanata. *Stamina* circiter 12, filamentis pilosulis e fundo dense piloso exortis. *Flores* ♀ pauci, basales, pedicello et sepalis masculis similibus. *Petala* nulla. *Disci glandulae* parvae, transversae. *Ovarium* depresso globosum, 4 mm diametro, 3 mm altum, dense cinereo-tomentosum. *Styli* fere usque ad basin bifidi, segmentis linearibus vel taeniiformibus 3-4 mm longis late patentibus glabris. *Capsula* non visa.

QUEENSLAND. *North Kennedy District* — Magnetic Island, Townsville, 9.vi.1922. *Sabine Helms* 1125 (BRI); Ibid., common along rocky seashore, straggling shrub, 24.vii.1938, *D.A. Goy* 329 (BRI, holotype).

This is a surprising species. Its closest relative is *C. pilophorus*, described in *Kew Bull.* 27: 83 (1972) from a single collection from the Morobe District of Papua New Guinea. This was growing in montane forest near a limestone ridge at an altitude of 1740 m only 7° south of the equator — a very different situation from a rocky seashore at about 15° S. The two species are distinguished from all others in the Australasian region by their very characteristic scaberulous indumentum, the shallowly indentate-crenate leaf-margin, and the dull muddy brown colour assumed on drying. The indumentum and leaf-margin suggest the possibility of a distant relationship with the common *C. candatus* Geisel., of West Malesia. *C. magneticus* must surely occur somewhere else along the coast of North Queensland.

***Croton* cf. *storckii*** (Muell. Arg.) A.C. Sm. in *Beruce P. Bishop Mus. Bull.* 141: 83 (1936).

*C. storckii* Seem. in *Bonplandia* 10: 297 (1862), nomen.

*C. verreauxii* var. *storckii* Muell. Arg. in *Linnaea* 34: 117 (1865) & in DC., *Prodr.* 15 (2): 621 (1866); Seem., *Fl. Vit.* 222, t. 57 (1867).

QUEENSLAND. *Cook District* — Claudie River, 12° 45' S., 143° 15' E., open forest, alt. 75 m, shrub or small tree with aromatic bark, old leaves turn orange-red prior to falling, 17.x.1974, *Hyland* 7817.

The specimen is sterile, but is distinctive on account of its complete glabrescence (except for the minutely pale-lepidote terminal bud). The leaves are broadly elliptic, up to 11 x 6 cm, thinly chartaceous, and green when dry. The base is narrowly rounded or broadly cuneate; the margin is practically entire; the apex (mostly damaged) rounded or subcuspidate; the lateral nerves 6-8 pairs, very slender, sharply prominent on the lower surface. The petiole is relatively long and slender, 1.5-3.5 cm long, and deeply grooved on the upper surface.

The only Australian species that this could conceivably be is *C. triacros* F. Muell., of the Atherton Tableland, but that usually has much shorter petioles and more or less immersed venation, and the sparse stellate pubescence is ferrugineous. I have therefore tentatively suggested a comparison with the Fijian *C. storckii*, which is sometimes remarkably similar in vegetative features. It is hoped that complete flowering and fruiting material from the Claudie River may soon become available.

***Croton tomentellus*** F. Muell., *Fragm. Phytogr. Austr.* 4: 141 (1864); Airy Shaw in *Kew Bull.* 33: 55 (1978), q.v.

NORTHERN TERRITORY (modern collections). East Arm, Darwin, tall open forest, edge of mangrove, lateritic red soil, tall shrub, light grey persistent bark, smooth, 2.xi.1965, *Palzer FRI 14793* (QRS); Mt. Bundy Mine area, 12° 52' S., 131° 38' E., among granite boulders, shrub  $\pm$  3.5 m, 13.x.1968, *Byrnes NB 942* (NT 14693, DNA D1911); *Ibid.*, shrub  $\pm$  4.5 m, 9.x.1968, *Byrnes NB 1204* (NT 14805, DNA D2130).

These are the first modern gatherings that I have seen of this rarely collected species, originally described from the Upper Victoria River.

***Croton tomentellus* F. Muell., var.**

QUEENSLAND. *Burke District* — 9 km E. of Lawn Hill Homestead, 18° 37' S., 138° 40' E., limestone outcrop about 1 km S. of road, fragmented deciduous vine thicket, v.1970, *Webb & Tracey 10637* (BRI, CANB).

Leaves ovate, up to 8 x 3 cm, rounded at base, shortly acutely acuminate, densely minutely adpressed-stellate-pubescent beneath, margin almost entire; young growth densely ochraceous-stellate.

***Croton* sp. nov.? aff. *C. tomentellus* F. Muell.**

WESTERN AUSTRALIA. *Kimberleys* — Bushfire Hill, Prince Regent River Reserve, 15° 28' S., 125° 39' E., in basaltic loam on slope, in open woodland, 14.viii.1974, *A.S. George 12282* (BRI, PERTH).

Leaves large, ovate, 13-28 x 9-11 cm, gradually narrowed to the apex, shallowly, inconspicuously and obtusely serrulate, densely minutely whitish-stellate beneath and softly puberulous from the erect central rays, glabrous above, drying ochraceous.

***Croton wassi-kussae* Croiz. in *J. Arnold Arbor.* 3: 375 (1942).**

var. ***stockeri* Airy Shaw, var. nov.**

Pube dense tomentosa valde distincta.

QUEENSLAND. *Cook District* — Old sand dune between Rocky River and Massey Creek, 13° 40' S., 143° 25' E., dry rain-forest, alt. 80 m, bush about 2.5 m high, flowers cream, scarcely opening, buds in F.A.A., 13.ix.1973, *Stocker 1076* (QRS, holotype; NSW, K, isotypes).

This is close to *C. wassi-kussae* Croiz., described from Papua, even to the definitely cordate-based leaves and rather few main nerves incised on the upper surface. With the narrow specific distinctions that seem usual in *Croton* it is not impossible that this taxon should be given specific rank, but until more is known of the local population I prefer for the present to draw attention to it as a well-marked variety. The dense tomentum gives it a very distinct appearance.

***Croton* sp. nov.?**

NORTHERN TERRITORY. *Gulf of Carpentaria* — Maria Island, 14° 54' S., 135° 44' E., limestone outcrop, patch of monsoon scrub, 17.vii.1972, *Dunlop M327* (NT 38939).

This is a sterile branch which I cannot match with any known species. The leaves are rather large, ovate, 9-14 cm long, 5-7.5 cm wide, rounded to very broadly cuneate at the base, narrowed to a subobtuse apex but not acuminate, thinly chartaceous or submembranaceous, smooth, virtually glabrous when mature, pale greyish green when dry, 5-nerved at the base, with 8-9 pairs of slender patulous laterals, the margin subentire; petiole elongate, 4-7 cm long, 1-2 mm thick, terete, sparsely minutely white-lepidote; apical 5 mm slightly darker in colour, as though pulvinate, but not thickened; apical glands small, lateral, sessile; young parts very minutely and densely whitish-stellate-lepidote. This probably represents an undescribed species and should be looked for by any future collector on the island.

***Croton* sp. nov.**

QUEENSLAND. *Cook District* — Archer River, 13° 25' S., 142° 10' E., gallery forest, alt. 30 m, small tree 6 m tall, with a spicy or peppery odour in the blaze, 16.ix.1974, *Hyland 7579* (QRS).

The material consists of leafy branchlets only, without flower or fruit, but is distinctive for the rather narrowly elliptic or oblong-elliptic outline of the larger leaves, which reach a size of over 13 x 4.5 cm, and for the deep almost chocolate-brown stellate indumentum of

the very young terminal growth. The leaves, which are thinly chartaceous in texture, bear small scattered brown stellate hairs on the lower surface, especially on the midrib; the margin is sometimes obscurely serrulate. The species seems very distinct from all the known Australian (and New Guinea) taxa, but I cannot at present suggest an affinity.

**Croton** sp. nov.

QUEENSLAND. *Cook District* — 19.2 km N. of Laura, 15° 25' S., 144° 25' E., Site No. 4A, 28.x.1974, A.C. Robinson 4A-9 (BRI).

Densely grey- or ochraceous-tomentose; leaves badly crumpled, perhaps up to 7 cm long, very shallowly and acutely serrulate; inflorescence up to 12 cm long; styles narrowly linear.

**Aleurites** J.R. & G. Forst.

(P. & H. 92)

**Aleurites moluccana** (L.) Willd., Spec. Pl. 4: 590 (1805); Airy Shaw in *Kew Bull. Addit. Ser.* 4: 29 (1975), q.v. for further references and for synonyms.

var. **moluccana**

QUEENSLAND. *Cook District* — Claudie River, 12° 45' S., 143° 15' E., rain-forest, alt. 80 m, tree 24 m high x 45 cm d.b.h., 29.vi.1972, *Irvine* 219; *Ibid.*, rain-forest margin, tree 13 m high, x 38 cm d.b.h., 10.x.1972, *Dockrill* 533; *Ibid.*, gallery rain-forest, alt. 80 m, tree 20 cm d.b.h., 13.x.1972, *Hyland* 2696 RFK; Rocky River, 13° 55' S., 143° 30' E., gallery rain-forest, alt. 50 m, 15.ix.1971, *Hyland* 5513; S.F.R. 144 (Windsor Tableland), 16° 15' S., 145° 5' E., dry rain-forest, alt. 900 m, tree 30 m x 80 cm with slightly flaky bark, bark flakes tend to be quite large e.g. 12 x 5 cm, note 2-celled ovary, 7.x.1971, *Hyland* 5577.

var. **rockinghamensis** Baill. in *Adansonia* 6: 297 (1866).

*A. moluccana* sec. Benth., Fl. Austr. 6: 128 (1873); Bailey, Queensl. Fl. 5: 1434 (1902); Hyland, Card Key Rain Forest Trees N. Queensl., 22 (1971); vix (L.) Willd.

QUEENSLAND. *Cook District* — About 6 miles [9.5 km] NW of Daintree on bank of Daintree River, 16° 10' S., 145° 18' E., fringing forest, sandy loam, tree 7 m, d.b.h. 20 cm, light grey bark, dark green leaves, 2 yellow glands at petiole/leaf-blade junction, fruits green, about 5 cm diameter, 21.xi.1967, *Boylard* (& *Gillieatt*) 516; Portion 188 Alexandra (Hutchinson Creek), 16° 10' S., 145° 25' E., in grassland which was recently rain-forest, alt. 15 m, tree 25 m x 60 cm d.b.h., flowers cream, 10.v.1973, *Hyland* 6726; Mowbray River, 16° 33' S. at its mouth, rain-forests, tree 12-15 m high; slightly ridged pale bark, pale brown when cut; leaves stiff, shining above, prominently reticulate beneath; midrib and principal lateral nerves rufous brown; inflorescence pale brown; flowers sweet-scented, 21.i.1932, *Brass* 1991; S.F.R. 933, 17° 00' S., 145° 50' E., rain-forest, alt. 100 m, flowers white, 14.ii.1975, *Hyland* 8014; S.F.R. 185, Nursery L.A., 17° 10' S., 145° 40' E., dry rain-forest, alt. 720 m, tree 20 m tall, 30 cm d.b.h., flowers with cream petals, ovary 3-locular, 31.xii.1971, *Hyland* 5737; S.F.R. 194, on the Dividing Range near Oak Creek, 17° 15' S., 145° 25' E., dry rain-forest margin, alt. 900 m, flowers with white petals, female flowers with 3- or 4-locular ovaries, 5.i.1972, *Hyland* 5749; Lake Eacham, Atherton Tableland, common in rain-forest on edge of lake, alt. 800 m, large tree 30 m high, leaves dark glossy green, young stems silvery, fruit brown, 4.viii.1929, *Kajewski* 1180. *North Kennedy District* — Rockingham Bay, n.d., *Dallachy* s.n. (holotype, MEL; isotype, K).

B. Hyland has pointed out to me that *Aleurites moluccana* occurs in two distinct forms in Queensland. The more northerly form, occurring in the Cape York Peninsula and again on the Windsor Tableland (16° 15' S.), is typical var. *moluccana*, with a very thin or evanescent indumentum, rather narrow leaves and a 2-celled ovary and fruit. The more southerly form, extending from the Daintree River (16° 10' S) and the Atherton Tableland to Rockingham Bay in North Kennedy District, has a more strongly developed subfloccose indumentum, often broader cordate leaves and a 3(-4)-celled ovary and fruit. (Note the slight geographical overlap of the two forms.) The southern form is evidently var. *rockinghamensis* Baill., a taxon that has been ignored or overlooked by later botanists including Bentham, Bailey, Domin and Pax & Hoffmann. The taxon was based upon a single collection from "Rockingham Bay", an area in which var. *moluccana* apparently does not occur. It is unfortunately not very clear, from Baillon's description, as to what he regarded as the main diagnostic features of his variety. The isotype in the Kew Herbarium consists of two detached broadly ovate leaves (the larger measuring 27 x 23 cm) and an

inflorescence consisting (as Baillon notes) almost entirely of male flowers. Both leaves and inflorescence bear the subfloccose indumentum of the southern form.

Var. *rockinghamensis* approaches the New Guinea plant described (*Kew Bull.* 20: 26 (1966)) as var. *floccosa* Airy Shaw, and it is probable that the latter may have to be reduced to Baillon's variety. The New Guinea form is extreme in its densely floccose indumentum, and sometimes produces unusually large flowers. Very few specimens with female flower or fruit have yet been collected, but in *Floyd NGF 7436*, from the Bulolo Valley, Morobe District, the female flowers have a clearly trilocular ovary, with 3 deeply bifid styles.

**Rockinghamia** Airy Shaw  
(P. & H. 105/a)

**Rockinghamia angustifolia** (Benth.) Airy Shaw in *Kew Bull.* 20: 29 (1966).

QUEENSLAND. (early collections). *Cook District* — Daintree River, 1881, *Pentzcke 7 & 22* (MEL).

**Rockinghamia brevipes** Airy Shaw in *Kew Bull.* 31: 389 (1976).

QUEENSLAND (early collections). *Cook District* — Mt. Bellenden-Ker, alt. 1560 m, 1887, *Sayer 118* (MEL); Mt. Bartle Frere, "A small tree 25 ft. about 600 ft. lower than Bartle Frere on the south side", 1891, 1892, *S. Johnson s.n.* (MEL).

**Claoxylon** Juss.  
(P. & H. 119)

**Claoxylon angustifolium** Muell. Arg. in *Linnaea* 34: 165 (1865) & in DC., *Prodr.* 15 (2): 786 (1866); Benth., *Fl. Austr.* 6: 129 (1873); Bailey, *Queensl. Fl.* 5: 1441 (1902); Pax & Hoffm. in Engler, *Pflanzenreich* IV. 147. vii: 125 (1914).

*Mercurialis angustifolia* (Muell. Arg.) Baill. in *Adansonia* 6: 323 (1866).

QUEENSLAND. *South Kennedy District* — Pease's Lookout, 21° 07' S., 148° 31' E., rain-forest, alt. 880 m, shrub, 12.x.1976, *Hyland 9131* (QRS); Mt. Etna, 23° 10' S., 150° 25' E., monsoon forest, alt. 200 m, shrub, 9.x.1976, *Hyland 9106* (QRS).

These are somewhat more southerly stations than the previously recorded localities of Bowen and the Cumberland Islands. *C. angustifolium* is a very isolated species, perhaps related to *C. nervosum* Pax & Hoffm., of eastern New Guinea.

**Claoxylon tenerifolium** (Baill.) F. Muell. See *Kew Bull.* 31: 390 (1976). Extension of range:

NORTHERN TERRITORY. Deaf Adder Gorge, 13° 02' S., 132° 58' E., sandstone rain-forest, in sink hole, shrub 2.5 m, 21.ii.1977, *Fox 251i*.

This represents the first record of any species of *Claoxylon* from the Northern Territory. The specimen is in fruit, and bears exceptionally large leaves, up to 23 x 12.5 cm.

The following records are of interest either for the localities or for the accompanying field notes.

QUEENSLAND. *Cook District* — New Holland, Endeavour River, 1770, *Banks & Solander* (MEL) (Britten, Ill. Bot. *Cook's Voy. Endeavour* 88, t. 290 (1905), as *C. hillii* Benth.); Thursday Island, vi. 1897, *F.M. Bailey* (BRI); Murray Island, 9° 55' S., 144° 02' E., vii. 1970, *M. Lawrie 20* (BRI); Base of Black Mountain (= Black Trevethan Range), SW of Cooktown, in open space in depauperate rain-forest at upper limit of vegetation, small tree, trunk sprawling over rocks, branches erect, branchlets ascending, leaves dark shiny green, flowers [♂] greenish-white, bark whitish, shallowly fissured, 23.xii.1966, *A. Rodd 216* (NSW); Sweet Creek, west side of Cook Highway, 16° 4' S., 145° 4' E., ridge above creek, clay, tree, these specimens from ridge where it is pioneering very successfully, but more commonly seen at the edge of rain-forest, flowers [♂] greenish-yellow, no smell, x.1974, *H.E. Brown 6007* (BRI).

B. Hyland's comments on the blaze odour of this plant are entertaining — "conspicuous but difficult to describe" (*Hyland 2156*, from SFR 194); "rather unpleasant" (*Hyland 2347*, *ibid.*); "obnoxious" (*Hyland 2052*, Mission Beach); "like rotten tomatoes" (*Hyland 6197*, Iron Range).



**Mallotus** Lour.  
(P. & H. 125)

**Mallotus** (§**Rottleropsis**) **claoxyloides** (F. Muell.) Muell. Arg. in *Linnaea* 34: 192 (1865) & in DC., *Prodr.* 15 (2): 972 (1866); Airy Shaw in *Kew Bull.* 20: 42 (1966), q. v. for further references and synonyms, & 31: 392 (1976) in clavi.

var. **cordatus** (Baill.) Airy Shaw, comb. nov.

*Echinus claoxyloides* (F. Muell.) Baill. var. *cordata* [sic.] Baill. in *Adansonia* 6: 315 (1866).

*Mallotus claoxyloides* var. *macrophylla* [sic] Benth., Fl. Austr. 6: 141 (1873); Bailey, Queensl. Fl. 5: 1447 (1902), synon. nov.

Baillon's varietal name for this luxuriant large-leaved tomentose form has apparently been overlooked, or perhaps by Bentham deliberately neglected, but it antedates Bentham's var. *macrophylla* by seven years, and should be restored. It was based by Baillon on four collections: *Dallachy* 4, from 'salt water creeks' at Rockhampton; *Mueller s.n.*, from Moreton Bay; and *Beckler s.n.*, from Richmond River and Clarence River. The form is possibly an ecotype growing in unusually favourable conditions.

var. **angustifolius** F.M. Bailey, Contrib. Queensl. Fl., in *Queensl. Dept. Agric., Bull.* No. 7 (*Bot. Bull.* No. 2): 18 (1891), & Queensl. Fl. 5: 1447 (1902); apparently not accounted for by Pax & Hoffmann (1914).

This very distinct form was described from Yandina, some 84 kilometres north of Brisbane, and there is a specimen at Kew (*Longman s.n.*) from Buderim Mt., a few kilometres south of this. In its cuneate-oblongate or cuneate-elliptic, sharply dentate leaves it is very distinct, and may deserve specific rank.

A very similar form, but with broader and only minutely dentate leaves, was collected on Lizard Island (Cook Distr., N. of Cape Flattery, viii. 1820, *A. Cunningham* 106, 3rd voyage). It could well represent a variation of var. *angustifolius*, but further collections are needed from the locality. Bentham and Bailey both cite it merely as *M. claoxyloides*.

var. **ficifolius** (Baill.) Benth., Fl. Austr. 6: 141 (1873); Bailey, Queensl. Fl. 5: 1447 (1902); Britten, Ill. Bot. Cook. Voy. Endeavour 89, t. 292 (1905).

*Echinus claoxyloides* (F. Muell.) Baill. var. *ficifolius* Baill. in *Adansonia* 6: 315 (1866). Type: "*Dallachy*, n. 47, Queensland; Rockhampton (herb. F. Muell.!)".

*Mallotus ficifolius* (Baill.) Pax & Hoffm., in Engler, *Pflanzenreich* IV. 147. vii: 151 (1914).

QUEENSLAND (early collections). *Cook District* — New Holland [Endeavour River], 1770, Banks & Solander (MEL). *South Kennedy District* — Port Mackay, n.d., *Amalia Dietrich* 1834, 2479 (MEL). *Port Curtis District* — near Rockhampton, always growing in the dry beds of creeks or amongst stones, small tree, flower [♂] yellow, 24.xii. 1862, *Dallachy* 47 (type, MEL); Rockhampton, n.d., *Thozet* 4 (MEL).

The status of this taxon in relation to var. *cordatus* is uncertain.

**Mallotus** (§ **Rottlera**) **discolor** F. Muell. ex. Benth., Fl. Austr. 6: 143 (1873); Bailey, Queensl. Fl. 5: 1449 (1902); Pax & Hoffm. in Engler, *Pflanzenreich* IV. 147. vii: 183 (1914); Francis, *Aust. Rain-forest Trees*, ed. 3, 230 (1970); descr. hic amplif. Type: N.S.W., Clarence River, mountain brush forests, 1862, *London Exhibition* 82 (K).

*Rottlera discolor* F. Muell. in Coll. Northern Woods N.S.W. London Exhib. no. 82 (1862), nomen.

*Macaranga mallotoides* sec. F. Muell., *Fragm. Phytogr. Austr.* 4: 140 (1864), in obs., non F. Muell. 1863.

*Mallotus repandus* sec. F. Muell., *Fragm. Phytogr. Austr.* 6: 185 (1868), in obs., non (Willd.) Muell. Arg.

The following items of information were noted on field labels to collections of this

species. "Tree pendulous in habit" (Grafton, N.S.W., 1914, *Boorman*). "Fruits soft, succulent when ripe" (Barney View, Qld., 1953, *E. F. Constable*). "This tree . . . has round yellow to clear when ripe berries, beloved by flying foxes" (Lower Clarence River, N.S.W., 1966, *A.A. Cameron*).

The following specimens represent the farthest north from which I have seen this species.

QUEENSLAND. *North Kennedy District* — 6 km N. of Elliot River, Cape Upstart, 19° 5' S., 147° 5' E., on frontal dune in low closed forest, tree 4 m tall, 9.iv.1975, *McDonald & Batianoff 1395* (BRI); Palm Islands (off Ingham), n.d., *Bancroft 72* (BRI). (The identification of the latter specimen is somewhat doubtful).

The female inflorescence and fruit of *M. discolor* seem not yet to have been adequately described. The following description is based upon two specimens from the Richmond River, N.S.W.: *Fawcett F31*, n.d. (MEL) and *Mrs Hodgkinson s.n.*, 1875 (MEL).

*Inflorescentiae* ♀ graciles, usque 3 cm longae, 3-7-florae, inferne nudaе. *Pedicelli* 1.5 mm. long, late patentes, bractea minuta suffulti. *Calyx* irregulariter 3-5-fidus, segmentis subulatis 2 mm longis basi carinato-crassiusculis breviter cupulari-connatis dimidio superiore tenui reflexis vel revolutis apice acuto extra dense brevissime adpresse cinereo-puberulis intus fere glabris. *Ovarium* breviter ovoideum, 3-4-loculare, 2 mm longum et fere aequae latum, granulis aurantiacis dense obductum, stylis 3-4 subulatis 2-3 mm longis arcte reflexis dense breviter plumoso-papillosis. *Capsula* depresso globosa, usque 8 mm diametro et 4 mm alta, 3-4-locularis, dense rubro-aurantiaco-granularis; semina (e capsula 4-loculari) triquetro-globosa, 4 mm diametro, laevia, fusco-brunnea.

***Mallotus* (§ *Mallotus*) *mollissimus*** (Geisel.) Airy Shaw in *Kew Bull.* 26: 297 (1971) & 31: 391 (1976), q.v.

QUEENSLAND. *North Kennedy District* — Port Denison, n.d., *Amalia Dietrich 2753, 2760* (MEL). *Port Curtis District* — Near Manifold, 22° 40' S., 150° 45' E., vine thicket, alt. 100 m, small tree, 6.x.1976, *Hyland 9061* (QSR).

The latter locality is possibly the most southerly from which *M. mollissimus* has yet been recorded.

***Mallotus* (§ *Rottlera*) *nesophilus*** Muell. Arg. in *Linnaea* 34: 196 (1865) & in DC., *Prodr.* 15 (2): 981 (1866); Benth., *Fl. Austr.* 6: 143 (1873); Bailey, *Queensl. Fl.* 5: 1449 (1902); Pax & Hoffm. in Engler, *Pflanzenreich* IV. 147. vii: 183 (1914). Syntypes: Cape Flinders, July, 1819, *Cunningham 295* (MEL, K); Sweers I., n.d., *Henne s.n.*; Quail I., 1855, *Flood s.n.* (MEL, K).

*Echinus nesophilus* (Muell. Arg.) Baill. in *Adansonia* 6: 314 (1866).

WESTERN AUSTRALIA. Roebuck Bay, July 1890, *Tepper 129* (MEL); W. Kimberley, Windjana Gorge, small tree, on river banks, 27.v.1974, *Beard 6962* (NSW).

NORTHERN TERRITORY. Port Darwin, 1881, *Holtze 157* (MEL); Ibid., small tree with round head, up to 30 feet [9 m], dioecious, ?1891, *Holtze 1153* (MEL); Quail Island, 1851, *Flood s.n.* (MEL); Sweers I., large shrub, 3.ix.1867, *B. Gulliver s.n.* (MEL); Maria I., fine spreading shrub with minute flowers, 6.ix.1867, [*B. Gulliver s.n.*] (MEL); Near Caledon Bay, shrub about 12 feet [3.5 m] high, with brownish leaves and yellow flowers, sandy situations, 1.x.1867, *B. Gulliver s.n.* (MEL); Melville Bay, small shrub with minute yellow flowers, found in dry places, 4.x.1867, *B. Gulliver s.n.* (MEL).

QUEENSLAND. *Cook District* — Edward River Mission, W. coast Cape York Peninsula, 14° 54' S., 141° 37' E., in monsoon woodland on shell sand, fruit orange, 20.viii.1974, *L. Johnson 7816* (NSW).

***Mallotus* (§ *Stylanthus*) *oblongifolius*** (Miq.) Muell. Arg. in *Linnaea* 34: 192 (1865) & in DC., *Prodr.* 15 (2): 973 (1866); Airy Shaw in *Kew Bull.* 26: 306 (1971) & *Kew Bull. Add. Ser.* 4: 173 (1975), q.v. for full references & synonymy, & *Kew Bull.* 31: 392 (1976) in obs.

QUEENSLAND. *Cook District* — Johnstone River, xii.1882, *Berthoud s.n.* (MEL).

This isolated record confirms the suggestion that I made in 1976 (l.c.) that *Mallotus oblongifolius*, a widespread Malesian species, might occur in North Queensland. The species seems never to have been collected in the state since 1882. Botanists in the Innisfail region are asked to watch for the plant.

None of the hitherto known Australian species of *Mallotus* belongs to the section

*Stylanthus*. *M. oblongifolius* may be distinguished by its elliptic or elliptic-oblong, chartaceous, slenderly petioled, subentire leaves, sparsely granular-glandular beneath and often either alternate or opposite on the same branch; by the spathaceous female calyx, by the sparsely and softly echinate capsule, and by the noticeable odour of fenugreek given off by dried herbarium material. Pubescence is variable, usually rather slight, but a more strongly pubescent form, var. *villosulus* Pax & Hoffm. in Engler, *Pflanzenreich* iv. 147 (Heft 7): 194 (1914) occurs in New Guinea. Berthoud's specimen from the Johnstone River is somewhat pubescent, but is scarcely referable to Pax & Hoffmann's variety.

**Mallotus (§ Rottlera) repandus** (Willd.) Muell. Arg. in *Linnaea* 34: 197 (1865) & in DC., *Prodr.* 15 (2): 981 (1866); Benth., *Fl. Austr.* 6: 142 (1873); Bailey, *Queensl. Fl.* 5: 1449 (1902); Airy Shaw in *Kew Bull.* 26: 301 (1971), q.v. for fuller references and synonymy.

QUEENSLAND. *Cook District* — Three Isles, Mangrove I., 12.ix.1973, *Stoddart 4519* (BRI, K). *North Kennedy District* — Rockingham Bay, climber growing on the beach, 8.vii.1865, *Dallachy s.n.* (MEL); *ibid.*, straggling-growing plant on the beach, 7.x.1867, *Dallachy s.n.* (MEL); Herbert River, small tree, flower [♂] yellow, foliage small, light green, 10.ix.1868, *Dallachy s.n.* (MEL); Port Denison, n.d., *Fitzalan s.n.* (MEL, K); Proserpine Creek, 11.ix.1863, *Dallachy s.n.* (MEL).

**Mallotus (§ Axenfeldia) resinosus** (Blanco) Merr. See *Kew Bull.* 31: 392 (1976).

*M. muricatus* (Wight) Muell. Arg. var. *walkeræ* (Hook. f.) Pax & Hoffm. in Engler, *Pflanzenreich* IV. 147, xiv (Euph.-Addit. vi): 18 (1919).

QUEENSLAND (early collections). *Cook District* — Endeavour River, 1881, 1882, 1886, 1887, *Persieh 118* (MEL); Cooktown, iv-vi.1889, *Warburg 19456, 19457* (*testibus* Pax & Hoffmann, l.c.; non vidi).

These early records extend the distribution of *M. resinosus* some kilometres southeast of Altonmoui, where Hyland collected it in 1972. It seems, however, never to have been re-collected on the Endeavour River, and may well now be extinct there, although the fact that Persieh obtained it at least four times in seven years suggests that in his day it may have been locally abundant.

Pax & Hoffmann's reference to the Warburg records of this species from Cooktown was overlooked by me in my earlier paper.

**Mallotus (§ Rottleropsis) tiliifolius** (Bl.) Muell. Arg. in *Linnaea* 34: 190 (1865) & in DC., *Prodr.* 15 (2): 969 (1866); Airy Shaw in *Kew Bull.* 26: 305 (1971) & *Kew Bull. Add. Ser.* IV: 170 (1975), q.v. for full references and synonymy, & *Kew Bull.* 31: 392 (1976) in obs.

*Croton enantiophyllus* K. Schum. in K. Schum. & Lauterb., *Nachtr. Fl. Deutsch. Schutzgeb. Südsee*, 296 (1905), *synon. nov.*

QUEENSLAND. *Cook District* — Big Creek, Prince of Wales Island, Torres Strait, 10° 45' S., 142° 15' E., mangroves and adjacent paper-bark swamps, tree or shrub, fruits greenish, *E. Cameron 20314, 20315, 20316* (QSR); Trinity Beach, 16° 48' S., 145° 42' E., sandy soil, alt. 4 m, tree 25 ft [7.5 m] high, fruit orange-coloured, 22.ix.1936, *Flecker 2591* (QSR).

These collections confirm the vague record of *M. tiliifolius* from 'Australia' (leg. *F. Bauer*) given by Pax & Hoffmann (in Engler, *Pflanzenreich* IV. 147, vii: 149 (1914)) and commented upon by myself (1976: 392). They also confirm the predilection of this species for coastal situations. Botanists from Cairns or Atherton are asked to search in forest remnants along the coast in the region of Trinity Beach to ascertain whether the species still persists there.

Among Australian species *Mallotus tiliifolius* is most closely related to *M. claoxyloides* (F. Muell.) Muell. Arg. It differs most obviously in the very broadly triangular-ovate shape of the leaves, in their almost entire or weakly repand-dentate margins and in the densely minutely grey-papillose foveolate-areolate ultimate venation of the undersurface, to which I have more than once drawn attention (1971, 1975, l.c.). Moreover the inflorescences of *M. tiliifolius* are typically elongate, sometimes as much as 20 cm long, whereas those of *M. claoxyloides* are usually greatly abbreviated (the females often candelabriform), rarely exceeding 5 cm in length.



*Mallotus derbyensis* W. V. Fitzg. in *J. & Proc. Roy. Soc. W. Aust.* 3: 165 (1918). Type: W. Australia, Derby, iv. 1905, *Fitzgerald 200* [NSW]. = *Grewia* cf. *breviflora* Benth., *Fl. Austr.* 1: 270 (1863).

Fitzgerald's specimen is in fruit only. It is certainly a *Grewia* and not a *Mallotus*, but the above suggested specific identification should be checked by someone familiar with the Australian species of *Grewia*.

**Alchornea Sw.**  
(P. & H. 136)

***Alchornea rugosa*** (Lour.) Muell. Arg. See *Kew Bull.* 31: 393 (1976).

QUEENSLAND. *Cook District* — Russell River, small tree n.d., [*S. Johnson?*] 92 (MEL), (mixed with *Croton verreauxii* Baill.); Brinsmead Gap, between Cairns and Redlynch, on edge of complex notophyll vine-forest, on red soils derived from metamorphic rocks, small tree to 4 m. x. 1973, *Webb & Tracey 10783* (NSW); State Forest Reserve 607, Bridle Logging Area, 17° 00' S., 145° 35' E., in power-line clearing in dry rain-forest, alt. 500 m, shrub 1 m tall, fruit green but probably fully developed, 21.xi.1973, *Hyland 7125* (NSW). *North Kennedy District* — Rockingham's Bay, n.d., *Dallachy* (MEL).

The above gatherings extend the Australian distribution of *A. rugosa* many kilometres south of the previous record from Iron Range, to the region of Cairns and Cardwell. It is strange that *Dallachy's* record was missed by Bentham (*Fl. Austr.* (1873)).

***Alchornea thozetiana*** (Baill.) Baill. ex Benth. var. ***longifolia*** Benth., *Fl. Austr.* 6: 137 (1873); Bailey, *Queensl. Fl.* 5: 1445 (1902). Type: Rockingham Bay, *Dallachy s.n.* (K).

QUEENSLAND (early collections). *Cook District* — Endeavour River, 1885, *Persieh 500* (MEL); *Ibid.*, 1886, *Persieh 832* (MEL).

These and *Hyland 7739* (from State Forest Reserve 607) are the only collections of var. *longifolia* that I have seen with male inflorescences. The type and one or two other recent collections (*Hyland 6472, 7125, 7738; Hartley & Hyland 14127*, also from S.F.R. 607) all bear female flower or fruit. It is possible that var. *longifolia* may deserve specific rank.

**Cleidion Bl.**  
(P. & H. 156)

***Cleidion javanicum*** Bl. See *Kew Bull.* 31: 394 (1976).

QUEENSLAND (further collections). *Cook District* — Upper Massey Creek, c. 24 km a little S. of ENE of Coen, in riverine rain-forest, alt. 105 m, fruits mostly 2-celled or occasionally 1-celled by abortion, 9.x.1962, *L.S. Smith 11707* (BRI, NSW); Gordon Creek, gallery rain-forest, 12° 45' S., 143° 20' E., alt. 60 m, 24.x.1973, *Hyland 6998* (BRI); Melvor River, 15° 10' S., 145° 05' E., gallery rain-forest, tree 10 m high x 20 cm d.b.h., 25.vii.1972, *Hyland 6270* (BRI). *North Kennedy District* — SFR 299 Conway, 20° 20' S., 148° 45' E., rain-forest, alt. 50 m, shrub 2-3 m tall, 2.viii.1974, *Hyland 7387* (BRI).

Not previously recorded from North Kennedy District.

**Macaranga Thou.**  
(P. & H. 157)

***Macaranga dallachyana*** (Baill.) Airy Shaw in *Kew Bull.* 23: 90 (1969) (sphalm. '-us') & 31: 396, in clavi (1976). Type: "*Dallachy* (1865), Rockingham's Bay, 'salt water creeks' (herb. *F. Muell.*)".

QUEENSLAND. *Cook District* — Near Mt. Bellenden-Ker, alt. 3500 ft [1050 m], huge tree, 60 miles from coast [?], 1888, *Christie Palmerston s.n.* (MEL); Danbulla, Stony Creek logging area, 17° 09' S., 145° 35' E., small tree, female, fruits greenish, 2.ix.1957, *L.S. Smith 10118* (BRI, K) growing with *M. subdentata* Benth. q.v., *infra*, p. 236). *North Kennedy District* — Saltwater Creek [? nr. Cardwell], small tree, yellow flowers, 10.xii.1864, *Dallachy s.n.* (MEL); *Ibid.*, small shrub, light green foliage, 2.iii.1865, *Dallachy s.n.* (MEL, type).

*Macaranga dallachyana* seems to be by far the scarcest member of the genus in Australia.

**Macaranga fimbriata** S. Moore. See *Kew Bull.* 31: 395 (1976).

QUEENSLAND. *Cook District* — T.R. 14, 13° 45' S., 143° 20' E., rain-forest, alt. 450 m, tree, 20 cm d.b.h., buttressed, 25.ix.1975, *Hyland* 3327 RFK (QRS).

This is not far from the Rocky River locality where *Hyland* 2860 RFK, recorded in 1976, l.c., was collected.

**Macaranga inamoena** F. Muell. ex Benth., *Fl. Austr.* 6: 145 (1873); Bailey, *Queensl. Fl.* 5: 1451 (1902); Pax & Hoffm. in Engler, *Pflanzenreich* IV. vii: 360 (1914); Airy Shaw in *Kew Bull.* 31: 396 (1976), in clavi. Type: Rockingham Bay, n.d., *Dallachy s.n.* (MEL, K).

QUEENSLAND (early collection). *Cook District* — Upper Russell River, 30 ft, (♂ flower and fallen fruit), 1887, *Sayer* 222 (MEL).

*Macaranga inamoena* seems to be a relatively frequent species in the rain-forests of the Atherton Tableland. There are numerous recent collections in QRS and BRI, and about ten in K.

**Macaranga inermis** Pax & Hoffm. See *Kew Bull.* 31: 395 (1976).

QUEENSLAND (early collections). *Cook District* — Innisfail, ? 1918, *Rev. N. Michael* 206 (NSW); Johnstone River, n.d., *Rev. N. Michael s.n.* (NSW) (type of *M. multiflora* C.T. White; cf. *Kew Bull.* l.c.). *North Kennedy District* — Rockingham Bay, n.d., *Dallachy s.n.* (MEL); King Ranch, in Tully River Valley, very common in swamps, with *Melaleuca quinquenervia* and *Archontophoenix alexandriae* in the high rainfall areas of North-east Queensland, n.d., collector? (NSW).

This is another of Dallachy's collections that failed to find a place in Benthams (*Fl. Austr.* (1873)).

**Macaranga involucrata** var. **mallotoides** (F. Muell.) Perry. See *Kew Bull.* 31: 394 (1976).

QUEENSLAND (early collection). *Cook District* — New Holland [Endeavour River], 1770, *Banks & Solander* (MEL).

**Macaranga subdentata** Benth., *Fl. Austr.* 6: 145 (1873); Bailey, *Queensl. Fl.* 5: 1451 (1902); Pax & Hoffm. in Engler, *Pflanzenreich* IV. 147. vii: 361 (1914); White & Francis, *Contrib. Queensl. Fl.*, in *Queensl. Dept. Agric. & Stock, Bot. Bull.* 22: 36 (1920); Airy Shaw in *Kew Bull.* 31: 396 (1976), in clavi. Type: Rockingham Bay, n.d., *Dallachy s.n.* (K).

QUEENSLAND. *Cook District* — Johnstone River, 1885, *Dr. Bancroft jun.* Barron River, not a very large tree, about 35 feet [10.5 m] high, 1891, *Stephen Johnson* (MEL); Gap Creek, 38 km S. by E. of Cooktown (9.5 km by road from Rossville), 15° 43' S., 145° 14' E., alt. 230 m, 7.ix.1960, *L.S. Smith* 11121 (BRI, K); Ridge of McDowal Range, 16 miles [26 km] NNW of Daintree, 16° 03' S., 145° 13' E., mesophyll vine-forest, red clay soil, 17.xi.1967, tree 6 m, d.b.h. 7.5 cm, leaves dark shiny green above, paler beneath, fruits yellowish-green, *Boyland (& Gillieatt)* 418 (BRI, K); Danbulla, Stony Creek logging area, 17° 09' S., 145° 35' E., small tree, male spikes terminated [occasionally] by a female flower, 2.ix.1957, *L.S. Smith* 10122 (BRI, K) (Apparently growing with *M. dallachyana*, q.v., supra); Pine Creek forestry road, Murray Prior Range, nr. Cairns, in complex mesophyll vine-forest in gully, on soils derived from granite, alt. 200 m, small tree to 15 m, x.1973, *Webb & Tracey* 10776 (NSW). *North Kennedy District* — Mount Macalister, deal of this in the scrub; small yellow flower; has been sent before, 3.iv.1867, *Dallachy s.n.* (MEL); Telegraph Line [Rockingham Bay area], 2.viii.1870, *Dallachy s.n.* (MEL); *ibid.*, shrub or small tree, leaves very long, light or dark green, fls. [♀] brown or brownish, 2 & 23.xi.1870, *Dallachy s.n.* (MEL).

### **Acalypha** L. (P. & H. 158)

**Acalypha wilkesiana** Muell. Arg. in DC., *Prodr.* 15 (2): 817 (1866); Pax & Hoffm. in Engler, *Pflanzenreich* IV. 147. xvi: 153 (1924).

QUEENSLAND. *Cook District* — Murray's Island, Torres Strait, 1878, *Rev. Chalmers s.n.* (MEL). *South Kennedy District* — Port Mackay, no date or collector's name (MEL 69829) (a single leaf only).

NEW SOUTH WALES (north-east). Richmond River, n.d., *Ramsay s.n.* (MEL).

Native of Polynesia; doubtless introduced into Australia as an ornamental garden plant.

**Codiaeum Bl.**  
(P. & H. 193)

**Codiaeum variegatum** (L.) Bl., Bijdr. Fl. Ned. Indie 606 (1825).

*Croton variegatus* L., Spec. Pl., ed. 3, 1424 (1764).

var. **moluccanum** (Decne) Muell. Arg. in DC., *Prodr.* 15 (2): 1119 (1866); Benth., Fl. Austr. 6: 147 (1873); Pax & Hoffm. in Engler, *Pflanzenreich* IV, 147. iii: 24 (1911).

*Codiaeum moluccanum* Decne in *Nouv. Ann. Mus. Hist. Nat. Paris* 3: 485 (1834).

*Croton mirus* Domin in *Biblioth. Bot.* 22: 882 (Heft 89: 328), t. 31, figs. 1-10 (1927)  
synon. nov. [Non sec. Airy Shaw in *Kew Bull.* 31: 385 & 388 (1976)].

I felt a considerable sense of shock when I set eyes on the type-specimen of *Croton mirus*, kindly sent on loan from the Prague Herbarium, and found that it was no *Croton* but a *Codiaeum*. The material, which is ample, gives the impression of having perhaps come from an exposed locality, causing a certain amount of stunting of the growth, especially of the petioles and inflorescences, and thus lacks the typical rain-forest appearance of *Codiaeum*. I confess to having been quite deceived by Domin's description and plate.

The specimen from the Cape York Peninsula, *Brass* 19462, that I identified with *Croton mirus* in *Kew Bull.* 31: 385 (1976), is described above (p. 224) as a new species, *C. brachypus* Airy Shaw.

**Codiaeum cf. membranaceum** S. Moore in *J. Linn. Soc., Bot.* 45: 219 (1920). Type: Cape York, 1868, *Daemel s.n.* (BM).

QUEENSLAND. *Cook District* — Tip Creek, 13° 00' S., 143° 25' E., rain-forest, alt. 30 m, tree, trunk 10 cm d.b.h., bark nondescript, fissured, flaky; very fine stripes in the inner blaze, 18.x.1973, *Hyland* 2919 R.F.K. (K).

The species of *Codiaeum* fall into two distinct groups: those with glabrous ovaries, including *C. variegatum* (L.) Bl., *C. luzonicum* Merr. (Philippines), *C. inophyllum* (Forst.) Muell. Arg. (New Caledonia), etc., and those with adpressed-pubescent ovaries, including *C. stellingianum* Warb. (Kei Islands), *C. bracteiferum* (Roxb.) Merr. (*C. brevistylum* Pax & Hoffm.) (Amboina), *C. cuneifolium* Pax & Hoffm. (Philippines), etc. *Hyland* 2919 from the Cape York Peninsula falls into the second group; the ovaries are conspicuously pubescent. The specimen is also notable for the markedly membranous texture of the leaves, and for this reason I think it is probably closely related to *C. membranaceum* S. Moore, which was described from a gathering of *Daemel* from Cape York Peninsula without further details of locality. Unfortunately this *Daemel* collection lacks female flowers, and thus the most diagnostic feature cannot be tested. Further collections of thin-leaved *Codiaeum* from Cape York, and especially from the Tip Creek population, are very desirable.

It is, however, further possible that *C. membranaceum* may be conspecific with *C. stellingianum*, and this in turn with *C. bracteiferum*. Both these species were described as having 'firmly membranaceous' leaves. Pubescent-ovariated material from the Moluccas, Tenimbar and Kei Islands exhibits distinctly thin foliage, though not quite so membranaceous as that of *Hyland* 2919. I am unable to make use of style-length for specific distinction; it seems to show the protean variability typical of *Codiaeum*. The same remark probably applies to stamen-number.

A further taxon with pubescent ovaries is represented by the *Codiaeum* population of the Louisiade Archipelago. The foliage of this population exhibits the same polymorphism as that of *C. variegatum*, including rheophytic adaptation, but is almost always stiffly coriaceous. Material of *Codiaeum* from the D'Entrecasteaux, Bismarck and Solomon Islands invariably possesses glabrous ovaries, and must be referred to *C. variegatum*. I have described the Louisiade plants elsewhere (*Kew Bull.* 33: 75 (1978)) as *C. ludovicianum*.

**Dimorphocalyx Thw.**  
(P. & H. 195)

**Dimorphocalyx australiensis** C. T. White in *Proc. Roy. Soc. Queensl.* 47: 80 (1936); Airy

Shaw in *Kew Bull.* 23: 125 (1969) & 29: 328 (1974). Type: Mowbray River, 1932, *Brass* 2019 (BRI).

*Tritaxis australiensis* S. Moore in *J. Linn. Soc., Bot.*, 45: 218 (1920). Type: Cape York, 1868, *Damel s.n.* (BM, K).

QUEENSLAND (early collections). *Cook District* — Cooktown, 1877, *Persietz s.n.* (MEL); Endeavour River, 1885 & 1886, *Persieh* 768 (MEL).

### **Endospermum Benth.**

(P. & H. 234)

**Endospermum myrmecophilum** L.S. Smith in *Proc. Roy. Soc. Queensl.* 58: 56, t. II (1947); Hyland, *Card Key Rain Forest Trees N. Queensl.*: 66 (1971); Schaeffer in *Blumea* 19: 181, 187, map 3 (1971).

QUEENSLAND. *North Kennedy District* (extreme NE) — Mission Beach, 17° 52' S., 146° 07' E., tree 7 ft [2.1 m] g.b.h., blaze odour like green beans; orange-yellow speckles and stripes in the blaze, 8.x.1968, *Hyland* 2050.

To be expected in other coastal localities of North Queensland. The species was originally described from eastern New Guinea.

### **Omphalea L.**

(P. & H. 237)

**Omphalea queenslandiae** F. M. Bailey. See Airy Shaw in *Kew Bull.* 20: 415 (1966), 23: 130 (1969) & 25: 550 (1971).

An early (?syntype) collection of this liane from the Johnstone River, 1885, *Dr. Bancroft jun.* (MEL), exhibits a feature which does not appear to be mentioned by any of the authorities that I have consulted: namely, the development of remarkable elongate hooked tendrils, much as in the genus *Ancistrocladus* (Ancistrocladaceae) of tropical Africa and Asia. These tendrils are probably modified inflorescences, but this is a point that could best be tested from observation of living plants in the field.

### **Homalanthus Juss.**

(P. & H. 241)

**Homalanthus novo-guineensis** (Warb.) Lauterb. & K. Schum. in Schum. & Lauterb., *Fl. Deutsch, Schutzgeb. Südsee* 407 (1901); Airy Shaw in *Kew Bull.* 21: 410 (1968), q.v.

*Homalanthus populifolius* sec. George & Kenneally in Miles & Burbidge (ed.), *Biol. Surv. Prince Regent River Reserve, Wildlife Research Bull. W. Aust.* 3: 47 (1975), non Grah.

In *Kew Bull.* l.c., 409 I indicated that this common New Guinea species extended into Queensland. The Australian distribution of this species and of *H. populifolius* Grah. is now becoming clearer. The latter species occurs commonly in eastern New South Wales and south-east Queensland, and extends northwards as far as the region of Rockingham Bay (*Dallachy s.n.*) and Dunk Island (*Adams* 20039), in the north-east of North Kennedy District. *H. novo-guineensis*, on the other hand, is now found to occur in Western Australia, in the Northern Territory, and in the region of the Atherton Tableland in the south-east of Cook District in Queensland. Thus the two areas approach rather closely, but apparently do not quite overlap, near the Cook/North Kennedy border.

I have seen the following Australian collections of *H. novo-guineensis*. The specimen from Buderim Mt., *Longman s.n.*, cited in *Kew Bull.* l.c., 411 is excluded as it is found to be *H. populifolius*.

WESTERN AUSTRALIA. Gariyeli Creek, Prince Regent River Reserve, 15° 32' S., 125° 13' E., on creek delta,

in silt in cadjeput forest, shrub to 6 m, bark roughish, latex present, leaves  $\pm$  bright green but not shining, fruit green turning dull red, 30.viii.1974, *George 12845*.

NORTHERN TERRITORY. Humpty Doo, 12° 34' S., 131° 20' E., rain-forest, slender tree to 9 m high, bark pale, with obvious leaf scars to base, 19.ix.1974, *Dunlop (& Airy Shaw) 3619*; "The Pines", Douglas River, 13° 43' S., 131° 38' E., rain-forest, spindly tree to 4 m high, 24.x.1974, *Parker 526* ( $\sigma$ ), *Must 1293* ( $\phi$ ).

QUEENSLAND. Cook District — Daintree River, 10.xii.1929, *Kajewski 1459*; *Ibid.*, light rain-forest, 7.iii.1932, *Brass 2247*; Mowbray River, rain-forests, 23.i.1932, *Brass 2006*; Bridle Creek, about 19 km SE of Mareeba, rain-forest margin, 21.xi.1973, *Hartley & Hyland 14142*; State Forest Reserve 143, South Mary Logging Area, 16° 25' S., 145° 25' E., rain-forest, alt. 900 m, tree 16 m x 30 cm d.b.h., 12.ii.1975, *Irvine 1144*.

The extremely short (0.5-2 mm) and strongly recurved style-branches and the 'tremeloid' bract-glands distinguish this species from *H. populifolius*.

**Monotaxis Brongn.**  
(P. & H. 282)

**Monotaxis (§ Monotaxis\*) tenuis Airy Shaw, sp. nov.**

Ab affini *M. macrophylla* Benth. habitu graciliore laxiore magis folioso, foliis sinuatis vel argute dentatis siccitate glauco-viridulis vel flavescentibus, inflorescentiis siccitate haud gummosis gracillime pedunculatis, floribus pro inflorescentia interdum usque 5 bene distincta. TYPUS: Northern Territory, *van Balgooy & Byrnes 1358* (K, holotypus).

*Herba* annua, 30-40 cm alta, erecta, glaberrima, ramis acute adscendentibus teretibus 0.5-1.5 mm crassis tenuissime striatulis. *Folia* spatulato-oblonga vel spatulato-ovata, 1.5-4 cm longa, 0.5-1 cm lata, basi in petiolum longe cuneato-attenuata, apice obtusa vel subacuta, margine aut sinuato-paucicrenata (raro subintegra) aut superne utrinque argute 3-7-dentata, inferne integra, tenuiter membranacea, laevia, siccitate viridula vel interdum sordide purpurascentia vel luride caerulescentia vel flavescentia, subtus glaucescentia et interdum minute albido-puncticulata; costa gracilis, supra incisa, subtus prominula; nervi laterales gracillimi, 4-5-jugi, acute adscendentes; petiolus fere filiformis, usque 2.5 cm longus; stipulae subulatae, 1 mm longae, acutissimae, inferne paucilaciniatae. *Inflorescentiae* in ramulis lateralibus vel subterminalibus tenuissimis gestae, dense capitatae, 4-6 mm diametro, floribus femineis 1-5 masculis numerosis comitatis. *Flos*  $\sigma$  pedicello 1-2 mm. longo suffultus. *Sepala* 4, ovata, acuta, 1 mm longa, valvata. *Petala* minima, cordato-reniformia, unguiculata. *Stamina* 8, antherarum thecis connectivo angusto sejunctis bilocellatis, locellis alabastro globosis duobus tantum fertilibus dehiscentibus post dehiscentiam transverse ellipsoideis. *Flos*  $\phi$  brevissime pedicellatus vel subsessilis. *Sepala* masculis similia. *Ovarium* primo subglobosum, 2 mm diametro, mox breviter oblongum, stylis brevibus basi connatis alte bicurvis segmentis breviter papillois apice attenuatis. *Cap-sula* brevissime oblonga, 2-3 mm longa et fere aequae lata, viridis, laevis, levissime 3-loba, interdum minute albido-puncticulata, stylis persistentibus erectis, post dehiscentiam columna tenui relictis. *Semina* breviter cylindrica, 2 mm longa, 1.2 mm lata, laevia, nitida, immatura ochraceo-castanea, carunculo fusco, matura rubro-brunnea, carunculo conspicuo albido praedita.

NORTHERN TERRITORY. W. Arnhem Land, 65 km NE of Pine Creek, locally common in sandy bed of dried-up creek, herb up to 40 cm, no milk-sap, stem purplish,  $\phi$  flower surrounded by  $\sigma$  flowers, 25.vii.1971, *van Balgooy & Byrnes 1358* (holotype, K); Q59, 31 miles [48 km] ENE of Mudginbarry Homestead, 12° 32' S., 133° 19' E., common in sandstone seepage area with outcrops, associated with mixed forbs, grasses and shrubs, erect perennial herb 1.5-2 ft. [45-60 cm] high, flowers yellowish-green and white, stems and leaves yellowish-green, 19.ii.1973, *Lazarides 7774*.

QUEENSLAND. Moreton District — Coomera Gorge, near Canungra, common in patches on rocky sides of the gorge, soft undershrub, flowers greenish-yellow, 30.iii.1937, *C.T. White 11051*.

Although this plant is evidently closely allied to *M. macrophylla*, I do not believe that it represents merely a weak form of that species. The slender stems and branches, the leafy habit, the sinuate or sharply dentate leaves, drying a somewhat glaucous green or even lurid bluish or purplish or yellowish, the very slenderly peduncled inflorescences, which lack all

\*Sect. *Linidion* Baill., Sect. *Eumonotaxis* Benth., including the type species of the genus, *M. linifolia* Brongn. According to the International Code the section must now be called Sect. *Monotaxis*.

gumminess, and the female flowers sometimes up to 5 in the inflorescence, are points of positive distinction. The superficial aspect of the plant is that of some rather weak crucifer.

The Queensland plant has sinuate leaves and up to 5 female flowers in the inflorescence, while the Arnhem Land plant has sharply dentate leaves and only 1-2 female flowers in a head. If these differences are constant in the respective populations, they might deserve varietal recognition. The genus is new to the flora of the Northern Territory.

The extraordinary isolation of the two populations should be noted: they lie about 1650 km apart, but the Queensland locality (south of Brisbane) is only a few kilometres from the more northerly of the only two known localities for *M. macrophylla*.

## APPENDIX 1

### Stilaginaceae *Antidesma* L.

***Antidesma schultzii* Benth.**, Fl. Austr. 6: 86 (1873); Pax & Hoffm. in Engler, Pflanzenreich IV. 147. xv: 134 (1922). Syntypes: Port Darwin, *Schultz* 610 & 743 (K).

NORTHERN TERRITORY. Unlocalised, c. 1800, *R. Brown s.n.* (K); Croker's Island, iv.1818, *Cunningham* 269 (K); Port Essington, iv.1840, *Armstrong* 570 & *s.n.* (K); Victoria River & Point Pearce, [1855], *Mueller s.n.* [Port Darwin,] 'Small shrubby tree, dioecious. Fruit smaller than *A. dallachyanum*. This seems the same as the plant from Port Essington mentioned by Bentham' [l.c.: 86, sub *A. dallachyanum*], 1891, *M. Holtze* 1243 (MEL); Channel Island, Darwin Harbour, stabilised dunes, shrub spreading to 5 m high, 3.ii.1972, *Byrnes* 2377; Vicinity of El Sharana, Eucalypt woodland, edge of dry creek, shrub 1 m high, fruit pale whitish-green becoming purplish red, glossy, 17.i.1973, *Wolfe* AE 393.

QUEENSLAND. *Cook District* — Claudie River, near airstrip turnoff, 12° 45' S., 143° 15' E., open forest, alt. 75 m, shrub in forest pocket, 17.x.1974, *Hyland* 7819; S.F.R. 144, 16° 20' S., 145° 00' E., open forest, alt. 600 m, shrub or small tree growing in the rocky bed of an ephemeral creek, 20.xii.1975, *Hyland* 8563.

*Antidesma schultzii* is closely related to *A. ghaesembilla* Gaertn., differing principally in its glabrescence, its acute sepals and its often irregularly shaped fruits with oblique styles. It appears to be rather widespread in the Top End of the Northern Territory. The specimens cited above from the Cape York Peninsula represent the first record of *A. schultzii* from Queensland.

***Antidesma parvifolium* F. Muell.**, Fragm. Phytogr. Austr. 4: 86 (1864); Benth., Fl. Austr. 6: 86 (1873); Bailey, Queensl. Fl. 5: 1433 (1902); Pax & Hoffm. in Engler, Pflanzenreich IV. 147. xv: 135 (1922); Domin in *Biblioth. Bot.* 22: 868 (Heft 89: 315) (1927). Syntypes: Port Denison, *Fitzalan*, *Dallachy*.

QUEENSLAND (early collection). *Port Curtis District* — prope Gladstone, n.d., *A. Dietrich* 327 (MEL).

The distribution of this species, originally described from Port Denison (Bowen), is carried some 350 miles southward by this early collection from near Gladstone (already noted by Domin, l.c. supra).

## APPENDIX 2

Notes on some new taxa proposed by Domin  
in *Biblioth. Bot.* 22: 860-892 (Heft 89: 306-338) (1927),  
based upon examination of type specimens

*Bridelia leichhardtii* var. *glabrata* Domin, l.c. 879 (325). An unimportant form showing extreme reduction of indumentum.

*Cleistanthus xerophilus* Domin, l.c. 879 (325). A very distinct species.

*Croton mirus* Domin, l.c. 882 (328) = **Codiaeum variegatum** (L.) Bl. var. **moluccanum** (Decne) Muell. Arg. Vide. p. 237, supra.

*Excoecaria dallachyana* (Baill.) Benth. f. *tenuispica* Domin, l.c. 892 (338). An insignificant variation.

*Flueggea virosa* var. *aridicola* Domin, l.c. 878 (324) = **Securinega melanthesoides** (F. Muell.) Airy Shaw var. **aridicola** (Domin) Airy Shaw. Vide p. 213, supra. *F. virosa* f. *reticulata* Domin, l.c., = **S. melanthesoides**, typical.

**Glochidion harveyanum** Domin, l.c. 873 (319). A good distinct species, but type material rather poor.

*Hexaspermum paniculatum* Domin, l.c. 870 (316) = **Phyllanthus clamboides** (F. Muell.) Diels. Vide p. 214, supra.

*Mallotus claoxyloides* f. *grossedentata* Domin, l.c. 388 (334) = var. **ficifolius** Baill.

*M. claoxyloides* var. *glabratus* Domin, l.c. An insignificant variant.

#### ACKNOWLEDGEMENTS

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Sincere thanks are once again due to the Bentham-Moxon Trustees for generously bearing three-quarters of the cost of the 3-month trip, and to the Royal Society for a grant-in-aid covering the remaining quarter.





# AN ALPHABETICAL CHECK-LIST OF NATIVE AUSTRALIAN EUPHORBIACEAE (EXCLUDING PHYLLANTHUS, EUPHORBIA, AND THE STENOLOBEAE)

by

H.K. AIRY SHAW\*

Comments and discussion on many of the taxa included in this list are given by Airy Shaw in *Kew Bulletin* 31: 341-398 (1976) and *Muelleria* 4: 207-241 (1980).

- Acalypha** L.  
  **capillipes** F. Muell.  
  **eremorum** Muell. Arg.  
  **memorum** F. Muell.
- Actephila** Bl.  
  **foetida** Domin  
  **latifolia** Benth.  
  **lindleyi** (Steud.) Airy Shaw. (*A. grandifolia* Benth.)  
  **mooriana** Baill. (= *A. lindleyi*?)  
  **petiolaris** Benth.  
  **scssillifolia** Benth.
- Adriana** Gaudich.  
  **glabrata** Gaudich.  
  **hookeri** (F. Muell.) Muell. Arg.  
  **klotzschii** (F. Muell.) Muell. Arg.  
  **quadripartita** (Labill.) Gaudich.  
  **tomentosa** Gaudich.
- Alchornea** Sw.  
  **ilicifolia** (J. Sm.) Muell. Arg.  
  **rugosa** (Lour.) Muell. Arg.  
  **thozetiana** (Baill.) Baill. ex Benth.  
    var. **longifolia** Benth.  
    var. **thozetiana**
- Aleurites** J.R. & G. Forst.  
  **moluccana** (L.) Willd.  
    var. **moluccana**  
    var. **rockinghamensis** Baill.
- Antidesma** L.  
  **?bunius** (L.) Spreng.  
  **dallachyanum** Baill.  
  **erostre** F. Muell. ex Benth.  
  **ghaescmbilla** Gaertn.  
  **parvifolium** F. Muell.  
  **schultzii** Benth.  
  **sinuatum** Benth.
- Austrobuxus** Miq.  
  **nitidus** Miq.  
  **swainii** (de Beuzev. & C.T. White) Airy Shaw
- Baloghia** Endl.  
  **lucida** Endl.  
  **marmorata** C.T. White  
  **parviflora** C.T. White
- Brcynia** J.R. & G. Forst.  
  **cernua** (Poir.) Muell. Arg.  
  **oblongifolia** (Muell. Arg.) Muell. Arg.  
  B. cf. **podocarpa** Airy Shaw  
  **rhynchocarpa** Benth.  
  **stipitata** Muell. Arg.
- Bridelia** Willd.  
  **exaltata** F. Muell.  
  **leichhardtii** Baill.  
  **penangiana** Hook. f.  
  **tomentosa** Bl.  
    var. **glabrifolia** (Merr.) Airy Shaw  
    var. **tomentosa**  
    var. **trichadenia** Muell. Arg.  
    var. **eriantha** Airy Shaw
- Choriceras** Baill.  
  **majus** Airy Shaw  
  **tricorne** (Benth.) Airy Shaw (*C. australiana* Baill., *Dissiliaria tricornis* Benth.)
- Claoxylon** Juss.  
  **angustifolium** Muell. Arg.  
  **australe** Baill., incl. var. **dentatum** Benth. & var. **laxiflorum** Benth.  
  **tenerifolium** (Baill.) F. Muell. (*C. hillii* Benth., *C. australe* var. **latifolium** Benth.)
- Cleidion** Bl.  
  **javanicum** Bl. (*C. spiciflorum* sec. Merr.)
- Cleistanthus** Hook. f. ex Planch.  
  **apodus** Benth.  
  **cunninghamii** (Muell. Arg.) Muell. Arg.  
  **dallachyanus** (Baill.) Baill. ex Benth.  
  **discolor** Summerh.  
  **hylandii** Airy Shaw  
  **myrianthus** (Hassk.) Kurz  
  **peninsularis** Airy Shaw & Hyland (*C. semiopacus* var. **curvaminis** Airy Shaw)  
  **semiopacus** F. Muell. ex Benth.  
  **xerophilus** Domin (*C. densiflorus* C.T. White)
- Codiaeum** Bl.  
  **membranaceum** S. Moore  
  **variegatum** (L.) Bl.  
    var. **moluccanum** (Decne) Muell. Arg.  
    (*Croton mirus* Domin!)
- Croton** L.  
  **acronychioides** F. Muell. (*C. affinis* Maiden & R.T. Baker)  
  **argyratus** Bl. (*C. schultzii* Benth.)  
  **armstrongii** S. Moore (*C. habrophyllus* Airy Shaw)  
  **arnhemicus** Muell. Arg.  
    var. **urenifolius** Baill.  
  **brachypus** Airy Shaw  
  **byrnesii** Airy Shaw  
  **capitis-york** Airy Shaw  
  **densivestitus** White & Francis (*C. pubens* Domin)

\*Royal Botanic Gardens, Kew, Richmond, Surrey, England, TW9 3AE.  
*Muelleria* 4 (3): 243-245 (1980).

- dockrillii** Airy Shaw  
**insularis** Baill.  
**magneticus** Airy Shaw  
**phebaloides** F. Muell. ex Muell. Arg.  
     var. **phebaloides** (*C. maidenii* R.T. Baker)  
     var. **hirsutus** F.M. Bailey(?)  
**C. cf. prunifolius** Airy Shaw, ined.  
**stigmatosus** F. Muell.  
**C. cf. storckii** (Muell. Arg.) A.C. Sm.  
**tomentellus** F. Muell.  
**triarcus** F. Muell.  
**verreauxii** Muell. Arg.  
**wassi-kussae** Croiz.  
     var. **stockeri** Airy Shaw  
**C. sp. nov. ?** (Cape York Penins.)  
**C. sp. nov. ?** (N. of Laura, Cook District, Qd)  
**C. sp. nov. ?** (Maria I., Gulf of Carpentaria)  
**C. sp. nov. ?** (Kimberleys, W.A.)
- Dimorphocalyx** Thw.  
     **australiensis** C.T. White (*Tritaxis australiensis* S. Moore)
- Dissiliaria** F. Muell. ex Benth.  
     **baloghioides** F. Muell. ex Benth.  
     **laxinervis** Airy Shaw  
     **muelleri** Baill. ex Benth.
- Drypetes** Vahl  
     **australasica** (Muell. Arg.) Pax & Hoffm.  
     **lasiogyna** (F. Muell.) Pax & Hoffm. (*Hemicyclia sepiaria* var. ? *oblongifolia* Benth.)  
     **subcubica** (J.J. Sm.) Pax & Hoffm.
- Endospermum** Benth.  
     **myrmecophilum** L.S. Smith
- Excoecaria** L.  
     **agallocha** L.  
     **dallachyana** (Baill.) Benth.  
     **parvifolia** Muell. Arg.
- Fontainea** Heckel  
     **pancheri** (Baill.) Heckel  
     **picrosperma** C.T. White
- Glochidion** J.R. & G. Forst.  
     **apodogynum** Airy Shaw (= *G. disparipes* var. ?)  
     **barronense** Airy Shaw (= *G. harveyanum* var. ?)  
     **benthamianum** Domin (*G. capitis-york* Airy Shaw)  
     **disparipes** Airy Shaw  
     **ferdinandii** (Muell. Arg.) F.M. Bailey  
         var. **ferdinandii**  
         var. **pubens** Maiden ex Airy Shaw  
     **harveyanum** Domin  
         var. **harveyanum**  
         var. **pubescens** Airy Shaw  
     **hylandii** Airy Shaw  
     **lobocarpum** (Benth.) F.M. Bailey  
     **perakense** Hook. f.  
         var. **supra-axillare** (Benth.) Airy Shaw  
     **philippicum** (Cav.) C.B. Rob. (*G. ferdinandii* var. *molle* (Benth.) F.M. Bailey)  
     **pruinsum** Airy Shaw  
     **pungens** Airy Shaw  
     **sessiliflorum** Airy Shaw  
     **xerocarpum** (O. Schwarz) Airy Shaw
- Homalanthus** Juss.  
     **novoguineensis** (Warb.) Lauterb. & K. Schum.  
     **populifolius** Grah.  
     **stillingiifolius** F. Muell.
- Hylandia** Airy Shaw  
     **dockrillii** Airy Shaw
- Leptopus** Decne  
     **decaisnei** (Benth.) Pojarkova  
         var. **decaisnei**  
         var. **orbicularis** (Benth.) Pojarkova
- Macaranga** Thou.  
     **dallachyana** (Baill.) Airy Shaw  
     **fimbriata** S. Moore  
     **inamoena** F. Muell. ex Benth.  
     **inermis** Pax & Hoffm. (*M. multiflora* C.T. White)  
     **involucrata** (Roxb.) Baill.  
         var. **mallotoides** (F. Muell.) Perry  
     **subdentata** Benth.  
     **tanarius** (L.) Muell. Arg.
- Mallotus** Lour.  
     **claoxyloides** (F. Muell.) Muell. Arg.  
         var. **angustifolius** F.M. Bailey  
         var. **claoxyloides**  
         var. **cordatus** Baill. (var. *macrophyllus* Benth.)  
         var. **ficifolius** Baill.  
     **didymochryseus** Airy Shaw  
     **discolor** F. Muell.  
     **mollissimus** (Geisel.) Airy Shaw (*M. ricinoides* (Pers.) Muell. Arg.)  
     **nesophilus** Muell. Arg.  
     **oblongifolius** (Miq.) Muell. Arg.  
     **paniculatus** (Lam.) Muell. Arg.  
     **philippensis** (Lam.) Muell. Arg.  
     **polyadenos** F. Muell.  
     **repandus** (Willd.) Muell. Arg.  
     **resinosus** (Blanco) Merr.  
     **tiliifolius** (Bl.) Muell. Arg.
- Margaritaria** L.f.  
     **dubium-traceyi** Airy Shaw & Hyland  
     **indica** (Dalz.) Airy Shaw
- Neoroepera** Muell. Arg. & F. Muell.  
     **banksii** Benth.  
     **buxifolia** Muell. Arg. & F. Muell.
- Omphalea** L.  
     **queenslandiae** F.M. Bailey
- Petalostigma** F. Muell.  
     **banksii** Britten & S. Moore  
     **nummularium** Airy Shaw  
     **pachyphyllum** Airy Shaw  
     **pubescens** Domin  
     **quadriloculare** F. Muell. (*P. humilis* W.V. Fitzg., *P. haplocladum* Pax & Hoffm., *P. micrandrum* Domin)  
     **triloculare** Muell. Arg. (*P. quadriloculare* var. *glabrescens* Benth.; *P. glabrescens* (Benth.) Domin)
- Pimelodendron** Hassk.  
     **amboinicum** Hassk.
- Rockinghamia** Airy Shaw  
     **angustifolia** (Benth.) Airy Shaw  
     **brevipes** Airy Shaw
- Sauropus** Bl.  
     **macranthus** (Hassk. (*Glochidion umbratile* Maiden & Betcher))
- Sebastiania** Spreng.  
     **chamaelea** (L.) Muell. Arg.
- Securinega** Juss.  
     **leucopyrus** (Willd.) Muell. Arg.  
     **melanthesoides** (F. Muell.) Airy Shaw  
     **?virosa** (Roxb. ex Willd.) Baill.

**Suregada** Roxb. ex Rottl.  
**glomerulata** (Bl.) Baill.

**Tragia** L.  
**novae-hollandiae** Muell. Arg.

**Trigonostemon** Bl.  
**inopinatus** Airy Shaw

**Whyanbeelia** Airy Shaw & Hyland  
**terrae-reginae** Airy Shaw & Hyland

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## A NEW SPECIES OF TEMPLETONIA (PAPILIONACEAE) FROM WESTERN AUSTRALIA

by

J.H. ROSS\*

### INTRODUCTION

An account of the genus *Templetonia* is being prepared for the Flora of Central Australia and this opportunity is taken of describing a very distinctive new species which occurs in Western Australia.

### DESCRIPTION

***Templetonia incana*** J.H. Ross, sp. nov., affinis incertae; ab omnibus speciebus dense incano-pubescentes, foliis magnis simplicibus, stipulis conspicuis differt.

Frutex usque ad 3 m altus, inermis; ramuli juveniles, folia, stipuli et calyces dense et persister incano-pubescentes. Folia simplicia; petiolus 0.6-1.6 cm longus; lamina 2.5-7.5 cm longa, 1.2-2.6 cm lata, elliptica, ovata vel elliptica-oblonga, apice rotundata vel obtusa, apiculata, costa et nerviis lateralibus subtus satis obviis. Stipulae conspicuae, 4-11 mm longae, 2.5-6 mm latae, dense et persister incano-pubescentes. Flore axillares, solitarii vel gemini; pedicelli usque ad 1.5 cm longi, persister incano-pubescentes; bractae ad basim pedicellorum usque ad 6 x 1.2 mm; bracteolae usque ad 5 mm longae, caducae. Calyx 5-dentatus, usque ad 17 mm longus. Corolla ruber; vexillum suborbiculare, usque ad 24 mm longum; carina et alae usque ad 24 mm longae, unguiculatae. Stamina 10; filamenta in columnam antice fissam connata. Ovarium usque ad 9 mm longum, glabrum. Legumina haud matura, oblonga, 1.7-2.5 cm longa, 0.9-1.2 cm lata. Semina ignota.

*Shrub* to 3 m high with several slender sparingly branched stems or a solitary much branched stem; young branchlets, leaves, stipules and inflorescences clothed with a dense greyish velvety indumentum; *stems* terete, unarmed, the epidermis on the older stems sometimes splitting to reveal a greenish-yellow or yellowish-brown inner layer. *Leaves* simple, petiolate; petiole 0.6-1.6 cm long; lamina (2.5) 3-7.5 cm long; (1.2) 1.5-2.6 cm wide, elliptic, ovate or elliptic-oblong, apex rounded or obtuse to slightly emarginate, apiculate, the midrib and some of the lateral veins raised and conspicuous on the lower surface. *Stipules* paired, conspicuous, 4-11 x 2.5-6 mm, variable in shape, obliquely ovate, orbicular or obovate-oblong, acute apically or apiculate, densely clothed with spreading hairs. *Flowers* 1 or 2 per axil, borne on pedicels 0.7-1.5 cm long, the pedicels densely clothed with spreading hairs; each pedicel with a basal, narrow-ovate, densely pubescent bract up to 6 x 1.2 mm and an apical pair of deciduous linear densely pubescent bracteoles up to 5.5 mm long, the bracteoles often shed shortly after the flower-buds open, the point of attachment of the bracteoles marked after their fall by a fringe of spreading hairs. Flower-buds completely enveloped by a dense indumentum. *Calyx* 5-lobed, up to 17 mm long, clothed with a dense indumentum of spreading hairs, the two upper lobes broader than the others, the lowest narrowest. *Standard* suborbicular, emarginate, red but variable, either red throughout or sometimes pale cream outside in upper half and/or yellowish basally, up to 24 mm long including a claw up to 6 mm long, up to 22 mm wide; *wings* up to 24 mm long including a claw up to 5 mm long, up to 10 mm wide, distinctly auricled; *keel* petals lightly united, pale green (fide A.S. George 14730), up to 24 mm long including a claw up to 5 mm long, up to 8 mm wide, distinctly auricled. *Stamens* 10, up to 24 mm long, the filaments joined in a sheath split open on one side, anthers alternately basifixed and dorsifixed. *Ovary* up to 9 mm long, glabrous, 4-6-ovulate; style slender, curved, with a small terminal stigma. *Immature pods* oblong, sometimes obliquely so, 1.7-2.5 cm long, 0.9-1.2 cm wide, with an acute lateral beak near the apex; valves coriaceous, glabrous. *Seeds* unknown.

\*National Herbarium of Victoria, Birdwood Avenue, South Yarra, Victoria, 3141.

*Muelleria* 4(3): 247-249 (1980).

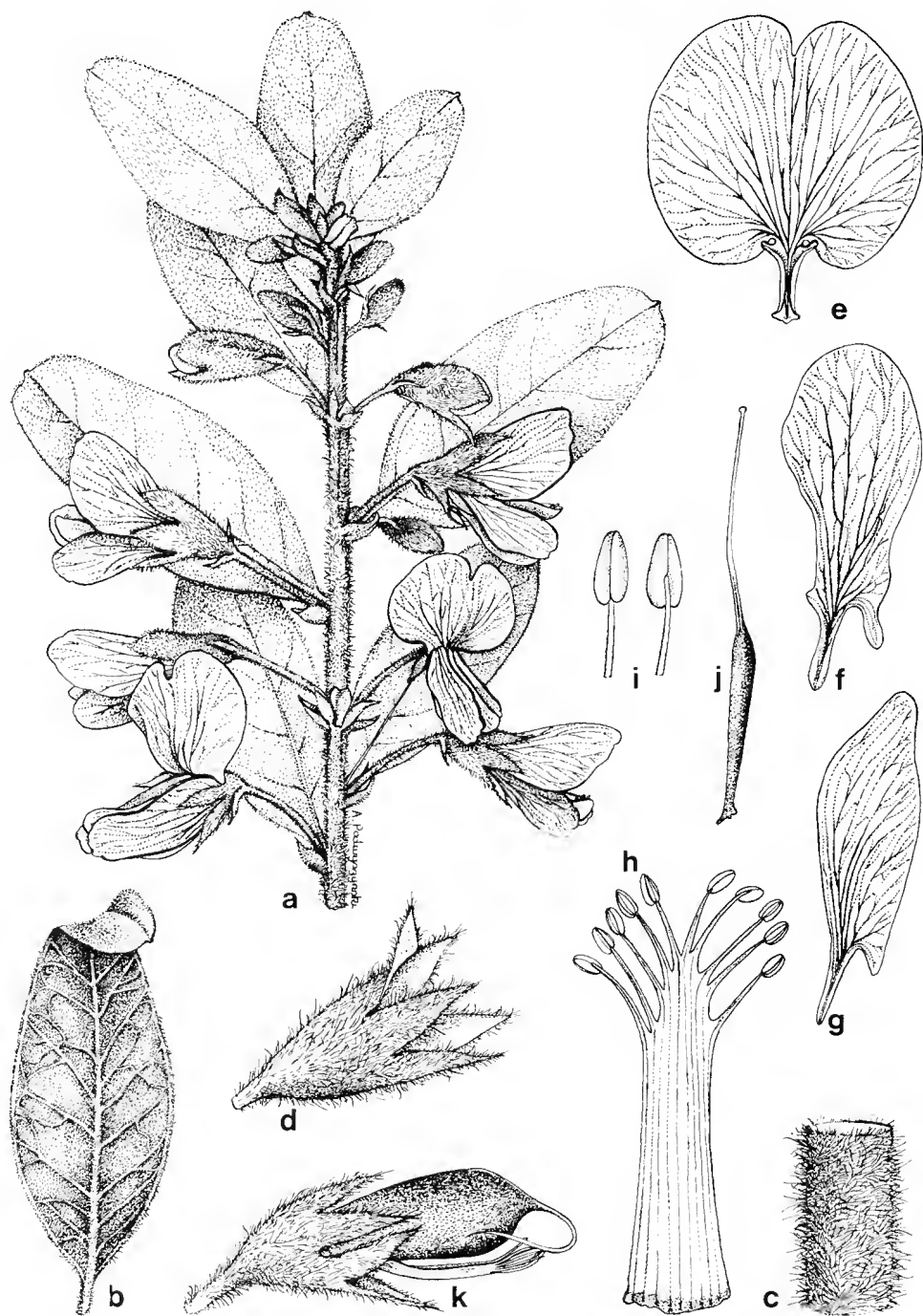


Fig. 1. *Templetonia incana*. a — flowering twig, x 1; b — leaf showing conspicuous raised venation on lower surface, x 1; c — section of stem showing the indumentum, x 4; d — calyx, x 2; e — standard, x 2; f — wing petal, x 2; g — keel petal, x 2; h — staminal tube opened out, x 2; i — rear view of anthers showing attachment of filaments, x 5; j — gynoecium, x 2, all from A.S. George 9065 (PERTH); k — immature pod and persistent calyx, staminal-tube and style, x 1½, from A.S. George 9140 (PERTH).



TYPE COLLECTION: Red sand dune 19 miles E.N.E. of Jupiter Well,  $\pm 22^{\circ} 46' \text{ S.}$ ,  $126^{\circ} 51' \text{ E.}$ , Western Australia, A.S. George 9065, 28.vii.1967 (Holotype: PERTH, Isotypes to be distributed to AD, CANB, K, MEL, PERTH).

ALSO EXAMINED:

Western Australia — Well No. 22, Canning Stock Route, Bureau of Mineral Resources, 26.vii.1956 (PERTH), 5 miles N.W. of Well 35, Canning Stock Route, J.S. Beard 4888, 25.vii.1967 (PERTH). Near Lake Auld, Great Sandy Desert, A.S. George 9140, 31.vii.1967 (PERTH). South of Well 42, Canning Stock Route, K. Palmer 22, vii.1976 (PERTH). McLarty Hills, Great Sandy Desert,  $\pm 19^{\circ} 30' \text{ S.}$ ,  $123^{\circ} 30' \text{ E.}$ , A.S. George 14730, 8.viii.1977 (PERTH). Canning Stock Route, N. of Tobin Lake, Great Sandy Desert,  $\pm 21^{\circ} 40' \text{ S.}$ ,  $125^{\circ} 40' \text{ E.}$ , A.S. George 15590, 4.v.1979 (PERTH).

*T. incana* is a very distinctive species which is readily distinguished from all others in the genus. It differs in that the young stems, leaves, stipules, pedicels, bracts, bracteoles and calyces are densely clothed with a greyish-white velvety spreading indumentum, and in having large simple leaves and conspicuous stipules. Although the indumentum in living plants is distinctly greyish, in some dried specimens, including the type material, the indumentum, especially on the lower surface of the leaves, is yellowish-brown. *T. retusa* (Vent.) R.Br. ex Ait. f., the only other species with large broad leaves, differs from *T. incana* in being glabrous or almost so, in having leaves of a different shape and texture, inconspicuous stipules, differently shaped flowers and in several other significant characters. In addition, *T. retusa* has a different range of distribution. *T. incana* does not appear to be closely related to any other species and its affinities are not clear.

Although fairly widely distributed in sandy soils in the Gibson, Great and Little Sandy Deserts in Western Australia where it grows on the crests of sand dunes, only seven collections of the species have been made. Mature pods have not yet been collected and the seeds are unknown. More material, particularly fruiting material, is required.

*T. incana* is an attractive plant which appears to have considerable horticultural potential. An effort should be made to introduce the species into cultivation.

#### ACKNOWLEDGEMENTS

I am most grateful to Dr. J. W. Green, Curator, Western Australian Herbarium for the loan of specimens, to Mr. A.S. George, Western Australian Herbarium, for kindly providing colour transparencies of *T. incana* and for checking the latin description, and to Miss A.M. Podwyszynski, National Herbarium of Victoria, for preparing the accompanying illustration.



THE HERBARIUM AND PLANT COLLECTIONS  
OF  
NORMAN A. WAKEFIELD (1918-1972)

by  
HELEN I. ASTON\*

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SUMMARY

The herbarium and associated catalogues of N.A. Wakefield are described and the significance of his collections to East Gippsland botany and to taxonomy is indicated. The incorporation of the herbarium in 1979 into the main collections of the National Herbarium of Victoria (MEL) is discussed in detail. This incorporation renders all of the Wakefield collections retained at MEL accessible for taxonomic studies. It involved labelling and mounting of approximately 2940 spermatophyte collections, 560 pteridophytes, and an additional 62 type collections. 85 duplicates (including 26 types) have been distributed elsewhere. An appendix of the 59 new species described by Wakefield in the *Victorian Naturalist* is given.

INTRODUCTION

**Biography**

Norman Arthur Wakefield was born on 28 November 1918 at Romsey, Victoria, and died on 23 September 1972 following a fall at his home at Sherbrooke, east of Melbourne. Biographical information is given by Willis (1964 and 1973) and Steenis-Kruseman (1958) and only a brief outline relevant to the understanding of his herbarium and plant collections is repeated here.

Until about 1950 most of Wakefield's adult life was spent as a primary school teacher with the Victorian Education Department at Orbost and other smaller and more isolated

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*Muelleria* 4 (3): 251-263 (1980).

centres of East Gippsland such as Combienbar, Cann River and Genoa. This gave him the opportunity to explore remote, and often rugged and barely-accessible regions in the vicinity. He used this opportunity to the full, making extensive plant collections and observations and becoming a recognized authority on the history of botanical exploration and the flora of East Gippsland. Although botany was his chief interest the geology and zoology of the region, particularly birds and mammals, also received his attention.

From August 1943 to July 1945 Wakefield collected ferns in New Guinea and the Solomon Islands while serving there with the armed forces.

About 1950 Wakefield moved from East Gippsland to Melbourne, in the vicinity of which he resided for the remainder of his life. He retained his employment with the Education Department, becoming Lecturer in Nature Study at Melbourne Teachers' College in 1955 and later moving to Monash Teachers' College. Following part-time studies at the University of Melbourne he graduated with the degree of Bachelor of Science in February 1960, with botany as the major subject. After 1960 his botanical investigations were virtually suspended as his interest in mammals and mammalian sub-fossils gained ascendancy. In 1969 he received the degree of Master of Science from Monash University for work on mammalian cave-fossils.

### Association with the Victorian Naturalist

Norman Wakefield had a long and active association with both the Field Naturalists Club of Victoria and the Club journal, the *Victorian Naturalist*. He joined the Club in May 1938, edited the journal from November 1952 to (excluding one year) April 1964, was elected an honorary member in November 1956 and received the Club's 1962 award of the Australian Natural History Medallion. Between 1938 and 1972 he contributed 167 articles to the *Victorian Naturalist*. These are listed by Baines (1976: 323-330). The majority (124) of the articles were on either plants, birds or mammals and it is interesting to note how the change in article subject with time (fig. 1) reflects the change in direction of Wakefield's work and interest.

Although Wakefield's publications were not confined to the *Victorian Naturalist* (see Willis 1964 and 1973, also Garran 1971: 282, for a guide to other major references) it is his botanical articles in that journal which are relevant to the N. A. Wakefield Herbarium.

	Number of articles		
	Plants	Birds	Mammals
1938-1960	71	21	5
1961-1972	3	3	21

Fig. 1. Number of articles on plants, birds and mammals published by N.A. Wakefield in the *Victorian Naturalist*, showing change of major interest from plants to mammals about 1960.

### BOTANICAL ACTIVITIES

During his most active period of botanical work (approx. 1938-60) N. A. Wakefield explored and collected extensively, found many new locality records, accumulated his own herbarium, donated specimens of particular importance to state herbaria, lent his collections to professional taxonomists engaged in botanical revisions and maintained wide botanical contacts. He frequently visited the National Herbarium of Victoria, Melbourne, to examine its collections and also paid working visits to other Australian herbaria. With the flora of East Gippsland, he concentrated at first on orchids and ferns, then investigated a wider

range of flowering plants. Between 1938 and 1950 he added 43 species (Wakefield 1969: 65) to the known flora of East Gippsland, including six species new to science which he described himself. Altogether he described at least 62 new plant species. Of these, 59 were published in the *Victorian Naturalist* (see appendix 1). In addition he published 5 new names and 22 new combinations in that journal.

It is convenient to consider Wakefield's botanical activity in four phases:

1. 1938-1944. Australian orchids and ferns
2. 1943-1945. Extra-Australian ferns
3. 1945-1960. Australian angiosperms (concentrated activity)
4. 1961-1972. Australian angiosperms (reduced activity)

Each phase reflects both a change in botanical emphasis and a change in Wakefield's manner of storing and cataloguing his collections. Details are given in the next section.

## HERBARIUM, COLLECTIONS AND CATALOGUES

### General

The N. A. Wakefield Herbarium has long been housed as a separate entity at the National Herbarium of Victoria (MEL). It was probably first housed there soon after Wakefield moved from East Gippsland to Melbourne as in 1953 he wrote (*Vict. Nat.* 70: 78) "The holotypes . . . are in the author's herbarium which is lodged in the Melbourne National Herbarium". Although Wakefield cited many of his collections, particularly type collections, as lodged at MEL, with duplicates at other designated herbaria, this was not strictly correct at the time of publication, but should be taken as a statement of intent (see fig. 8). In fact these cited collections mostly remained within his own herbarium and many have not been accessible for examination until processing of the whole Wakefield Herbarium and its incorporation into the main MEL collections was accomplished during 1979. Before that year only a few of the cited collections were represented either in total or by a duplicate or fragments in MEL (see appendix 1).

### HERBARIUM N. A. WAKEFIELD (1918-1972)

Fig. 2. Label placed with collections originating from the Wakefield Herbarium. Actual size.

All material processed in 1979 has had a printed label (fig. 2) stating "Herbarium N. A. Wakefield/(1918-1972)" included with it.

To assist in processing the main Wakefield Herbarium and also accessory collections presented to the National Herbarium of Victoria in 1974 by his wife, Mrs Audrey Wakefield, three temporary indexes (now discarded) were prepared from information given in Wakefield's botanical articles published in the *Victorian Naturalist*. These indexes provided:

1. An alphabetical guide to all new species, with details of any Wakefield collections cited (i.e. types, including paratypes in the broad sense).
2. An alphabetical guide to all other species for which there were important published notes, e.g. first records for East Gippsland; habitat notes.
3. A numerical list of all Wakefield numbers cited.

The indexes were constantly consulted during processing to allow appropriate annotation of collections and to avoid the discarding of any specimens which, although inadequate in themselves, might be important voucher material.

The identifications typed onto newly-prepared MEL labels are those accepted by Wakefield himself, irrespective of whether they are currently considered correct. Where the identification given on herbarium wrappers (as in the spermatophyte collection) or on labels

(as in the pteridophyte herbarium) differed from that shown in the appropriate catalogue the wrapper or label identification generally proved to represent the most recent name accepted by Wakefield, or the name he used when citing the particular collection in literature, and was therefore the name placed on the MEL label. This retention of Wakefield identifications should assist future workers in coupling his collections with his published records. Where necessary, a present-day redetermination slip has been added. For example, numbers 3110, 3189 and 3497 were all located in the main spermatophyte herbarium under *Pultenaea amoena* but were catalogued as *P. stricta*, i.e. Wakefield's original identification. As he cites these collections under *P. amoena* in *Vict. Nat.* 73: 164-165 (1957), this name has been typed on the MEL labels. Since *P. amoena* is now generally considered a synonym of *P. linophylla* the three collections have been redetermined as the latter species and placed under it in the MEL collections.

Catalogues associated with the herbarium are now lodged in the library at MEL. They list numbers 1 to 504 (pteridophytes) and 2001 to 4936 (chiefly spermatophytes). In them, early collections often receive higher collection numbers than later collections (e.g. many 1945 collections are numbered in the 3-4000's, many 1947 collections are numbered in the low 2000's), showing that collection numbers were allotted at the time of cataloguing rather than at the time of collection. At times Wakefield also allotted numbers to collections made by others (see under Pteridophytes).

No catalogues have been found for numbers 505 to 2000, or for those above 4936, although a few specimens bearing numbers in these ranges were located. In a few cases numbers between 4863 and 4915 had each been used for two separate collections. Where such cases involve important collections, e.g. 4915 *Juncus subsecundus*, paratype, an annotation has been placed with the collection during processing.

### Details

Details of the various segments of the Wakefield Herbarium and collections are given here, in relation to the four major phases of his botanical activity mentioned on p. 253.



Fig. 3. Sample card (shortened) from Wakefield's display set of "100 orchids of Gippsland". The newly-prepared MEL label is included. X 0.5.



## 1. 1938-1944. AUSTRALIAN ORCHIDS AND FERNS

## ORCHIDS

The main orchid collections of the Wakefield Herbarium were arranged as a display set of 102 cards, each folded to give a centre section about 28 cm long by 13 cm wide with two infolding side sections of similar size (fig. 3). The display set was accompanied by a card stating "100 orchids of Gippsland". For each card, a specimen or specimens was mounted on the centre section. The left side bore the scientific name, locality of the collection, and sometimes the date; sometimes a list of other localities from which the species was known appeared beneath the locality of the collection — where such a list appeared the localities were usually added in a slightly smaller size and different ink, and indented from that of the mounted specimen. The right side of each card bore the common name, notes on habitat, abundance, or special comments such as "only known East Gippsland colony". All writing was in Norman Wakefield's hand. The pattern described varied a little on some cards, but was basically similar on all.

No catalogue exists for this orchid set, and the specimens were unnumbered. Almost all were Wakefield's own collectings but a few were obtained by him from other collectors.

In mounting orchids from this series onto MEL sheets the writing from the left side flap was placed to the left of that from the right side flap, and a standard MEL label bearing the typed annotation "Taken from N. A. Wakefield's display set of "100 ORCHIDS OF GIPPSLAND"" was added. A list of Wakefield's six *Victorian Naturalist* articles on the orchids of East Gippsland was included with each sheet to assist botanists in locating possible further information on any collection.

## FERNS

The herbarium of Wakefield's Australian fern collections was neatly arranged in systematic order. Each collection was enclosed in a full-size white herbarium sheet approximately 43 x 28 cm, and accompanied by a machine-printed collection label headed "PTERIDOPHYTA" (fig. 4). Each label was completed in Wakefield's handwriting, giving identification, collector, locality and date of collection, habitat notes, and also Wakefield's catalogue number marked on the top left hand corner. Sometimes the standard label was missing and replaced by (usually) a plain paper label bearing the necessary information. The sheets for each species were grouped according to the state of origin and placed in brown paper wrappers used to denote systematic groupings (species, genus and family wrappers).

278 PTERIDOPHYTA

Name *Pleurosorus rutifolius* (R.Br.) Fee

Collector N.A. Wakefield

Locality Bindi, E. Gipps Date 29/1 1939

Notes In crevices of limestone  
and granitic rocks.

Fig. 4. Sample collection label from Wakefield's pteridophyte herbarium. Actual size.

With small ferns two or more collections of the same species were sometimes found within the one white sheet. In such cases each collection had its own label carefully placed on top of or beside it. As the sheets were firmly tied in bundles and had not been tampered with the possibility of collections and labels moving within their sheets had been avoided and the collections, with their respective labels, could safely be segregated for mounting.

Catalogues consisting of loose sheets of notepaper accompanied the fern herbarium. One catalogue listed Wakefield's own collections from Victoria, New South Wales and Queensland, with dates ranging from 1938-1944, and including catalogue numbers 1 to 504. The identification, locality, and date (usually year only) of collection appeared against each number. For each collection the data in this catalogue was checked against that of the corresponding collection label and if any major discrepancy was found the collection was discarded.

A second catalogue listed collections made by others, e.g. Flecker from Queensland and Somerville from Tasmania. These collections were sometimes located within the main pteridophyte collection just described and sometimes in irregular accessory bundles labelled in various ways, often with typed slips. No collection numbers were given in this catalogue but one or two numbers were usually present on the typed slips found with the collections. One of these numbers (when two were present) represented the actual collector's number but the other, located at left of the slip, was apparently allotted by Wakefield himself after receipt of the collection. A catalogue of these numbers has not been found.

## 2. 1943-1945. EXTRA-AUSTRALIAN FERNS

Willis (1964: 194) records that Wakefield collected some 600 fern specimens in the tropics during wartime and that the first set of 322 numbers was presented to the British Museum (Natural History) in London, the remainder being lodged at the Melbourne Herbarium. Steenis-Kruseman (1958) records that Wakefield collected in New Guinea and the Solomon Islands between August 1943 and July 1945, and that a first set of about 800 specimens covering about 300 species of pteridophytes was deposited at the British Museum. Steenis-Kruseman noted that "In due time a complete set will be placed in Herb. Melbourne, and some duplicates at Brisbane and Florence." Wakefield's New Guinea or Solomon Islands collections were not present in his herbarium at MEL and no trace of them has yet been found in either the main or accessory MEL collections. Willis (pers. comm., 1979) has no recollection of them reaching MEL and it is possible that they are still undistributed from the British Museum.

## 3. 1945-1960. AUSTRALIAN ANGIOSPERMS (CONCENTRATED ACTIVITY)

The collections pertaining to this period of concentrated angiosperm study formed the major part of the Wakefield Herbarium, and were largely catalogued and arranged in systematic order. A few gymnosperms and pteridophytes were also present. Each collection was enclosed in a folded sheet of newspaper bearing the collection number. A few sheets contained additional handwritten information such as locality, date, or habitat notes. All sheets of the same species were enclosed in a brown paper wrapper bearing the handwritten specific epithet. The wrappers for all species of the same genus were then enclosed in a brown paper wrapper bearing the handwritten generic name (fig. 5). All sheets and wrappers were approximately 32 x 23 cm and handwritings were in Wakefield's own hand.

The key to these collections lay in three exercise books used as catalogues. Two of these books (numerical catalogues — fig. 6) list numbers 2001 to 4936 in numerical order, with the identification, locality and date of collection alongside each number. They record collections made from 1945-1959. The third book (geographical catalogue) contains all species listed in systematic order. Against each species is a list of the localities from which that species had been recorded. Where a collection had been made the collection number is usually noted against the appropriate locality.

Using the collection number shown on any news sheet (together with any other notes which might be present), the identification as discerned from the generic and species wrappers, the data given in the numerical catalogue, and cross-checking with the species as shown in the geographical catalogue, it has been possible to obtain basic information for most collections and to label them accordingly. A standard MEL herbarium label was typed

CHENOPODIUM  
DRIMYS  
PLANTAGO  
STIPA  
affinis R.Br.  
ellipticum (Vent.) R.Br.  
hypoglaucus A.Gray.  
teretifolia Steud.

Fig. 5. Wakefield's handwriting from the generic and species wrappers of his main angiosperm herbarium. X 0.75.

3903	<i>Marsdenia rostrata</i>	Ward Island	1945.
3904	<i>Convolvulus umbellatus</i>	Suggan Suggan	31-1-1945.
3905	<i>Calyptegia marginata</i>	upper Combarbar	28-10-1945
3906	" <i>spira</i>	Lower Combarbar	Ca. 10-1946
3907	<i>Dichonaea repens</i>	Combarbar.	28-10-1945
3908	<i>Cynoglossum lasifolium</i>	Isle River	Ca. 10-1945.
3909	" <i>suaviscent</i>	Bonham	Ca. 9-1945.
3910	" <i>mostrata</i>	Murrumbidgee	21-10-1945.
3911	<i>Verbena officinalis</i>	Carlo Rock.	25-1-1947.

Fig. 6. Portion of the numerical catalogues to the main angiosperm collections, showing Wakefield's handwriting. X 0.75.

of specimens. Under separate cover I am forwarding several species for identification. Included in the packet are mature specimens of Rutidosia pumila and of the species labelled "Juncus capitatus". I regret that I cannot obtain Limosella aquatica as required; I shall send it as soon as I can.

Following are notes on the Juncaceae forwarded.

Yours faithfully,  
N.A. Wakefield.

Fig. 7. Handwriting of N.A. Wakefield, from letter to the Government Botanist, Melbourne, July 1939. X 0.75.

for each collection, with a general district and grid reference (e.g. East Gippsland. Grid Z—29) being added to Wakefield's basic data. The grid references relate to locality and are those used by Churchill and de Corona (1972) and figured by Todd in *Muelleria* 4: 174 (1979). A question mark was used where the grid reference may be slightly inaccurate due to imprecision in the original locality data.

Whenever data from the herbarium and notebooks was conflicting or indefinite (e.g. "locality?") the collection was discarded.

#### 4. 1961-1972. AUSTRALIAN ANGIOSPERMS (REDUCED ACTIVITY)

Collections from this period of reduced botanical activity remained uncatalogued and mostly unnumbered in many accessory bundles. These bundles lacked any regular arrangement. Those specimens with sufficient data (e.g. 75 varied collections from Erinundera and adjacent regions, May 1969; 63 collections of *Juncus* spp.) were labelled and retained, and the remainder discarded.

A few of the collections were numbered in the 5000's to 6000's but no catalogue is available for these. All information was confined to that accompanying each specimen.

#### 5. ACCESSORY COLLECTIONS — VARIOUS PERIODS

Assorted packets were intermingled with the bundles containing Wakefield's late collections. These packets contained some quite valuable material, including types, derived from the earlier periods of his collecting and active taxonomic work. Their chief contents were:

a. Material from the catalogued collections which had been extracted for special examination by Wakefield or other taxonomic workers but had not been replaced; e.g. 35 *Poa* collections determined by J. Vickery; *Brachycome* collections examined by G. L. Davis, including type material of *B. riparia*; material of *Tmesipteris* removed from the pteridophyte collections, including type material of *T. ovata* and *T. parva*; type material of a number of angiosperms described by N. A. Wakefield including 10 holotypes and 5 isotypes of *Pomaderris* spp.

b. A few collections borrowed from MEL or other herbaria, including type fragments of *Pomaderris halmaturina* from AD. These collections have been returned to the herbaria of origin.

c. 82 collections of W. Hunter from East Gippsland, each with Hunter's own handwritten label.

A standard herbarium label, with district and grid reference, was typed for each of these accessory collections retained at MEL.

Material of the Snowy & Snowy River  
Daisy If any of this should become  
 Type material, could the Holotype  
 be returned? My private herbarium  
 is in the Melbourne National  
 Herbarium & many specimens  
 therein are simply cited as "MEL".  
 It will be incorporated in the  
 general collections eventually.  
 In any case please return  
 about one-third of this material,  
 including part of each number.

N.A. Wakefield

Fig. 8. Handwriting of N.A. Wakefield — note which accompanied material of *Brachycome riparia* (then undescribed) sent to Dr G.L. Davis in 1954 for her examination. X 0.75.

### Summary of contents

In summary, the 1979 processing of the Wakefield Herbarium yielded:

1. Collections now incorporated at MEL
  - a. approx. 2940 spermatophytes.
  - b. approx. 560 pteridophytes.
  - c. all or part of 62 type collections, including
    - i. 57 of the 74 type collections gathered by Wakefield and pertaining to the 59 new species described by him in the *Victorian Naturalist*.\*
    - ii. 4 isotypes (non-Wakefield collections) of Wakefield species.\*
    - iii. holotype collection of *Brachycome riparia* G. L. Davis.
  - d. 25 Wakefield collections (non-type) cited by other authors.
  - e. many voucher collections (non-type) for records published in the *Victorian Naturalist*.
2. Duplicates despatched elsewhere
  - a. 20 isotypes of Wakefield species.\*
  - b. 5 paratypes of Wakefield species.\*
  - c. 1 isotype of *Brachycome riparia* G.L. Davis (to NSW).
  - d. 59 non-types (NSW 48; CANB 4; BRI 6; K 1).
3. Collections discarded
  - a. approx. 560 spermatophytes (numbered collections).
  - b. 12 pteridophytes (numbered collections).
  - c. sundry parcels containing unnumbered collections with inadequate or no data.

There were no crytogenic collections within the Herbarium.

### ACKNOWLEDGEMENTS

To Mrs Audrey Wakefield, who in 1974 donated accessory material to the National Herbarium of Victoria, thereby ensuring that the final portion of her late husband's collections would join his main herbarium and not be lost to botanical workers, acknowledgement is sincerely given.

Assistance with labelling of the spermatophyte collections and with sorting and labelling of the pteridophyte herbarium was given by Ms Jill Ambler and Mr Grant Bretherton respectively during their periods of temporary employment at the National Herbarium of Victoria under special funding schemes. Their assistance is gratefully acknowledged.

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\*see appendix 1.



## APPENDIX 1

New species described by N.A. Wakefield in the *Victorian Naturalist*

Column 3: Indicates all Wakefield collections cited with the type description. *Unbracketed number* = collection number specified by Wakefield. *Bracketed number* = collection data cited but number not specified by Wakefield; number discerned from herbarium labels, annotations and/or catalogues. *NAW* + = joint collection, no number cited. *Dash* = no Wakefield collections cited.

Columns 4-6: H = holotype. I = isotype. L = lectotype. P = paratype (in the broad sense). S = syntype (here denotes original type collections cited other than those later selected as lectotypes).

Column 5: a. Number of sheets found in the Wakefield Herbarium during the 1979 processing and now placed in the MEL collections.

b. Number of sheets already in the MEL collections prior to 1979.

Column 6: Additional sheets distributed from the Wakefield Herbarium in 1979. Abbreviations as in *Index Herbariorum* (1974).

1	2	3	4	5a	5b	6
				No. of sheets		
Species	Reference in <i>Vict. Nat.</i>	Wakefield number	Type Herbarium status	Wakefield	MEL	Replicates distributed to:
<b>PTERIDOPHYTA</b>						
<i>Cyathea marcescens</i>	59: 33-34 (1942)	95	S	2	1	
	70: 9 (1953)	96	L	—	1(?L)	
<i>Hypolepis australis</i>	72: 95 (1955)	107	H	1	—	
<i>Hypolepis muelleri</i>		179	P	—	—	
	60: 42-43 (1943)	114	H	2	—	
<i>Schizaea asperula</i>	70: 9 (1953)					
	59: 89-90 (1942)	12	S	1	—	
<i>Sticherus lobatus</i>		13	L	1	—	
		14	S	1	—	
		15	S	1	—	
	60: 110 (1943)	31	H	2	—	
	70: 9 (1953)	(30) wrongly cited as 31	P	2	—	
<i>Tmesipteris ovata</i>	60: 143 (1944)	374	H	1	1(I)	
	70: 9-10 (1953)	375	P	1	—	
		(486)	P	1	1	
<i>Tmesipteris parva</i>	60: 143 (1944)	(376)	H	1	1(I)	
	70: 10 (1953)	377	P	—	—	
		(485)	P	1	1	
<b>SPERMATOPHYTA</b>						
<i>Acacia hunteriana</i>	72: 92-93 (1955)	2383	P	1	—	
		2702	P	1	—	
		4059	P	1	—	
		4697	P	1	—	
		4810	H	1	—	BRI, CANB, K, NSW (all I)
<i>Acacia paucijuga</i>	72: 93-94 (1955)	—				
		2093	P	1	—	
		2508	P	—	1	
		4805	P	2	—	BRI, CANB, K, NSW, PERTH
		4809	P	—	—	
<i>Astrotricha parvifolia</i>	73: 168 (1957)	—				
<i>Cassinia trinerva</i>	68: 69 (1951)	—				
<i>Crassula tripartita</i>	73: 186 (1957)	—				
<i>Dodonaea rhombifolia</i>	72: 22-23 (1955)	—				
		4688	P	—	1	
		4808	P	—	—	
<i>Galium binifolium</i>	72: 69-70 (1955)	4794	H	—	1(H)	
<i>Galium liratum</i>	72: 70-71 (1955)	3957	P	1	—	
		4800	H	—	1(H)	

<i>Grevillea dryophylla</i>	73: 74 (1956)	—				
<i>Grevillea steiglitziana</i>	73: 74-75 (1956)	—				
<i>Helichrysum alpinum</i>	68: 49 (1951)	—				
<i>Helichrysum angustum</i>	68: 49 (1951)	—				
<i>Helichrysum conditum</i>	68: 50 (1951)	—				
<i>Helichrysum secundiflorum</i>	68: 49 (1951)	—				
<i>Hibbertia australis</i>	72: 120-121 (1955)	—				
<i>Hibbertia exutiacies</i>	72: 118 (1955)	—				
<i>Hibbertia rufa</i>	72: 119 (1955)	NAW+	H	—	1(H)	
<i>Hibbertia spathulata</i>	73: 166-167 (1957)	4832	H	1(I)	1(H)	AD, CANB, K, NSW (all I)
<i>Hydrocotyle algidus</i>	72: 55 (1955)	NAW+	H	—	?	
<i>Juncus ingens</i>	73: 211 (1957)	4835 (5881)	H P	1(H)1(I) 2	—	K, NSW (both I)
		wrongly published as 4881 (5894)	P	1	—	
		wrongly published as 4894				
<i>Juncus subsecundus</i>	73: 211-212 (1957)	4873 (5915)	H P	1 —	1(?I) 1	
		wrongly published as 4915				
<i>Lepidosperma limicolum</i>	70: 75-76 (1953)	2080 3384 3596	P P P	1 1 1	— — —	
		4720	H	—	1	
<i>Lepidosperma urophorum</i>	70: 76-78 (1953)	NAW+ 2001 3389	H P P	— — 1	1 — —	
		4721	P	—	—	
<i>Leptospermum glabrescens</i>	72: 43-44 (1955)	2874 2875 4125 4220 4806	P P P P H	1 1 1 1 1	— — — — —	AD, K, NSW (all I)
<i>Leucopogon piliferus</i>	73: 58-59 (1956)	—				
<i>Leucopogon riparius</i>	73: 59 (1956)	3135 4336	P H	1 2	— —	K, NSW (both portions of H)
		4773	P	1	—	
<i>Olearia algida</i>	73: 97 (1956)	—				
<i>Pimelea biflora</i>	73: 212-213 (1957)	—				
		2582	P	—	—	
<i>Pomaderris affinis</i>	68: 140 (1951)	4398	H	1	—	
<i>Pomaderris angustifolia</i>	68: 142 (1951)	4381	H	1	—	
<i>Pomaderris argyrophylla</i>	68: 141 (1951)	—				
<i>Pomaderris aurea</i>	68: 140 (1951)	4435	H	1	—	
<i>Pomaderris brunnea</i>	68: 142 (1951)	—		1(I)	—	
<i>Pomaderris costata</i>	68: 142 (1951)	2088	H	1	—	
<i>Pomaderris cotoneaster</i>	68: 141-142 (1951)	4423	H	1	—	
<i>Pomaderris eriocephala</i>	68: 141 (1951)	4434	H	1	—	
<i>Pomaderris pallida</i>	68: 142-143 (1951)	—		1(I)	—	
<i>Pomaderris pauciflora</i>	68: 142 (1951)	4389	H	1	—	
<i>Pomaderris pilifera</i>	68: 140 (1951)	2089	H	1(H)1(I)	—	
<i>Pomaderris sericea</i>	68: 140-141 (1951)	4431	H	1	—	
<i>Pomaderris sieberiana</i>	68: 140 (1951)	2041	H	1	—	
<i>Pomaderris subcapitata</i>	68: 141 (1951)	—		1(I)	—	
<i>Pomaderris tropica</i>	68: 141 (1951)	—				
<i>Pomaderris vellea</i>	68: 142 (1951)	—		2(I)	—	
<i>Pultenaea amoena</i>	73: 164-165 (1957)	—				
		3110	P	1	—	
		3189	P	1	—	
		3497	P	1	—	
<i>Pultenaea platyphylla</i>	73: 164 (1957)	—				

<i>Scirpus victoriensis</i>	73: 163-164 (1957)	—				
<i>Spyridium cinereum</i>	73: 165 (1957)	4834	H	1	—	K, NSW (both I)
<i>Spyridium nitidum</i>	73: 166 (1957)	—				
<i>Tieghemophanax multifidus</i>	73: 167-168 (1957)	4833	H	1(H)1(I)	—	CANB, K, NSW (all I)
<i>Westringia cremnophila</i>	73: 186-187 (1957)	4687	P	1	?	
		4772	H	1	?	
		4774	P	1	?	
<i>Westringia crassifolia</i>	73: 187 (1957)	—				

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# STUDIES IN AUSTRALIAN CENTROLEPIDACEAE I: THE SCAPELESS SPECIES OF CENTROLEPIS LABILL.

by

D.A. COOKE\*

## SUMMARY

The inflorescence of *Centrolepis* is discussed and terms used in describing the genus are defined. Four species distinguished by their scapeless habit are described and differentiated from reduced states of *C. polygyna* (R.Br.) Hieron. A new species, *C. caespitosa*, is described; *C. basiflora* C.H. Ostenfeld is reduced to a synonym of *C. inconspicua* W.V. Fitzgerald; a lectotype of *C. cephaliformis* F.M. Reader is chosen, and *C. murrayi* J.M. Black is reduced to a subspecies of *C. cephaliformis*.

## INTRODUCTION

*Centrolepis* Labill. (1804) is a genus of about 24 species of small annual or perennial herbs distributed throughout Australia except arid areas, also in south-eastern Asia, New Guinea, and New Zealand. Within the family Centrolepidaceae it is characterized by the structure of its greatly condensed cymose compound inflorescence, here described as the head (Fig. 1).

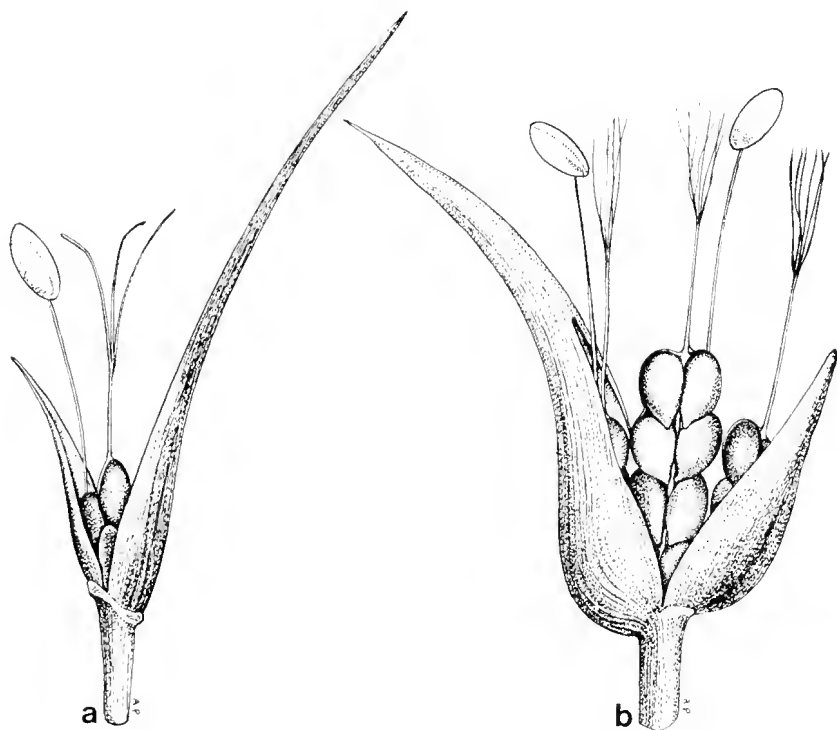


Fig. 1. Flowering heads opened by pulling apart the primary bracts to reveal the pseudanthia; both X15. a — *Centrolepis caespitosa*. From holotype. b — *Centrolepis cephaliformis* ssp. *cephaliformis*. The pseudanthia are shown spread apart from their natural position. From MEL 1502447.

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*Muelleria* 4 (3): 265-272 (1980).

Each head is enclosed by two (rarely three in atypical specimens) *primary bracts* subopposite on the main axis, the lower (outer) bract partly sheathing the upper (inner).

The flowers of *Centrolepis* are here regarded as unisexual, the male flowers each being reduced to a single stamen with a dorsifixed unilocular anther, and the female flowers to single carpels each containing one ovule. This interpretation was first suggested by Eichler (1875).

The unit inflorescence of *Centrolepis* is interpreted as a *pseudanthium* formed by a greatly condensed and reduced monochasial cyme, with an initial male flower (rarely absent) followed by one to many female flowers forming a compound gynoeceium. As a pseudanthium develops, successive carpels are crowded upwards by the expansion of the preceding ones, the sympodial axis of the cyme forming an erect *gynophore*. This process is illustrated by Stones in Curtis (1973). Each carpel has a terminal style; the styles are initially separate but in most species become fused, those of the lower carpels joining with the gynophore.

*Secondary bracts* are leaves within the head reduced to nerveless hyaline scales. In species where these are present, there is typically one associated with the stamen and one associated with the base of the gynoeceium; they may be regarded as subtending the first two branches of the sympodial axis of the pseudanthium. Additional secondary bracts may be present between the pseudanthia, subtending cyme branches below the pseudanthia.

Within the head, the pseudanthia are arranged in one or more cymose partial inflorescences (Hieronymus, 1873). In species such as *C. fascicularis* Labill. with numerous pseudanthia and a short internode between the primary bracts it is easy to trace a monochasial cyme of pseudanthia in the axil of each bract. Where the inflorescence is reduced to one or a few pseudanthia between opposite primary bracts, as in *C. polygyna* (R.Br.) Hieron., they cannot be assigned to either bract, and could be interpreted as forming a terminal cyme on the main axis. In all species, the internodes of the cymes are completely suppressed and the pseudanthia sessile.

The leaves of *Centrolepis* consist of a scarious basal sheath passing into a linear or subulate lamina. In the primary bracts the sheaths are modified to enclose and protect the inflorescence; the laminae may remain well-developed as photosynthetic organs, or be partly or completely suppressed. Another type of modified leaf is the *cataphyll* produced at the last node below the head in some species, consisting of the scarious portion of the leaf, the lamina being completely aborted.

The species grouped here as '*scapeless*' are those minute annual species in which the heads are borne among the foliage, terminal on internodes up to 3 mm long. In other species of *Centrolepis*, each head is manifestly raised on an erect leafless scape at least 8 mm long at maturity.

## TAXONOMIC TREATMENT

### KEY TO SPECIES

1. Leaves distichous, none of them reduced to cataphylls; head containing hyaline secondary bracts .....1. *C. inconspicua*  
 Leaves spirally arranged, the leaf below each head reduced to a scarious cataphyll; head lacking secondary bracts .....2.
2. Head ovoid-conic, at least half as wide as long; plant lacking dark pigment .....2. *C. cephaliformis*  
 Head  $\pm$  cylindrical, less than half as wide as long; leaves and/or primary bracts developing dark pigment .....3.
3. Primary bract sheaths hyaline; inner primary bract with a recurved tip similar to tips of foliar leaves .....3. *C. caespitosa*  
 Primary bract sheaths thickened, brown-pigmented; inner primary bract lacking a foliar tip .....4.
4. Leaves broad-linear, conduplicate towards the base; head laterally compressed; carpels 1-7 .....4. *C. humillima*  
 Leaves terete to subulate; head terete; carpels 6-14 .....5. reduced states of *C. polygyna*



1. ***Centrolepis inconspicua*** W. V. Fitzgerald in *Proc. Linn. Soc. N.S.W.* 28: 107 (1903). Type: Pinjarrah, in wet spots, x.1900, Fitzgerald (Holo: NSW 60350!).

TAXONOMIC SYNONYM: *C. basiflora* C.H. Ostenfeld in *Biol. Meddel. Kongel. Danske Vidensk. Selsk.* 3 (2): 13 (1921), *synon. nov.* Type: Armadale prope Perth, 20.ix.1914, Ostenfeld 11 (Syntypes: C n.v.; MEL 535280 !).

Small glabrous annual herb. *Roots* few, sparsely branched, to 3 cm long. *Stem* very short, unbranched, with internodes of negligible length. *Leaves* 2-5, basal, distichous, erect; basal sheath scarious, 3-4 mm long, passing into a linear lamina 4-28 mm long, tip obtuse. Cataphylls absent. *Head* terminal, sessile, 1-2 mm wide, 1.5-3 mm long; occasionally one or more additional heads sessile in the axils of the upper leaves. *Primary bracts* 2, opposite,  $\pm$  gaping at anthesis, similar to the leaves but shorter, 4-16 mm long, the outer one slightly longer than the inner. Bract sheaths 1.5-3 mm long, with membranous margins terminating in minute lobes. *Secondary bracts* 2 per pseudanthium, hyaline, 2-3 mm long, acute and entire or  $\pm$  erose; additional shorter secondary bracts often present between the pseudanthia. *Pseudanthia* 2-5 per head, all bisexual. *Stamen* 1, not adnate to gynophore; filament 2-4 mm, anther elliptic c. 0.8 mm long. *Gynoecium* of 1-4, usually 2, carpels superposed alternately biseriate on a gynophore. Styles c. 2 mm long, becoming connate at the base only. *Seed* brown, ovoid, c. 0.5 mm long, smooth.

#### DISTRIBUTION:

*Western Australia* — known from three localities in the Darling and Avon districts, but may be expected to be more widespread in south-western W.A. and probably overlooked due to its small size.

#### ECOLOGY:

Growing in moist sites, including moss beds. Flowering September to October.

#### SPECIMENS EXAMINED (total 4):

*Western Australia* — 17 miles E. of Pingelly, Tutanning Reserve, 18.ix.1962, Royce 7541 (PERTH); W.A. n.d., n.coll. (MEL 1502031).

#### NOTES:

*C. basiflora* C.H. Ostenfeld is, from the protologue description and from a comparison of type material, not distinguishable from *C. inconspicua* W. V. Fitzgerald.

*C. inconspicua* is closely allied to *C. aristata* (R.Br.) Rocrn. & Schult., from which it is distinguished by the absence of a scape, the narrower head with fewer pseudanthia, and the single stem never proliferating to form a dense tuft. The presence of axillary heads in some plants is a character apparently unique to this species of *Centrolepis*. Although it has been found growing in association with *C. aristata* by Ostenfeld (1921), the two species do not intergrade. A series of 55 collections of *C. aristata* from south-western Western Australia was examined by the author and showed discontinuities in variation with *C. inconspicua* in the above characters.

2. ***Centrolepis cephaloformis*** F.M. Reader in *Vict. Nat.* 19: 97 (1902); Ewart, 'Fl. Vict.' 260 (1931); Willis, 'Handb. Pl. Vict.' 1: 278 (1962). Type: Sandy Desert, Lowan, 1892, F.M. Reader (Lectotype (here chosen): MEL 536054 pro parte !. Syntypes: MEL 536054 pro parte !; MELU 11831 !).

The type sheet in MELU does not bear a label in Reader's writing, and consists of one plant which was probably removed from the MEL collection. One of the plants on the sheet MEL 536054 is a depauperate specimen of *Centrolepis polygyna* (R.Br.) Hieron.; the individual plant at top right of this sheet is here designated as the lectotype of *C. cephaloformis* F.M. Reader.

Small glabrous annual herb forming dense, rounded tufts 4-25 mm in diameter. *Stem* repeatedly branching from the axils of the lower leaves forming internodes less than 1 mm

long. *Leaves* 3-9 mm long, with a scarious sheathing base passing into a  $\pm$  recurved, linear to subulate lamina terminating in a hyaline mucro. Uppermost leaf reduced to an obtuse, scarious sheathing cataphyll 0.8-2 mm long. *Head* terminal on an internode 0-3 mm long; ovoid-conic, 1-1.6 mm wide, 2-3 mm long. *Primary bracts* 2, opposite, tightly enclosing the head. Outer bract with a pale, scarious, keeled basal sheath 2-3 mm long passing abruptly into a terete, awn-like lamina 2-4 mm long; inner bract pale, scarious, keeled, 2-3 mm long, acute to apiculate, lacking a lamina. *Secondary bracts* absent. *Pseudanthia* 1-3 per head. *Stamen* 1 per pseudanthium or absent, not adnate to gynophore; filament 2-4 mm long, anther ovate-elliptic, c. 0.5 mm long. *Gynoecium* of 4-10 carpels superposed in subopposite pairs on a gynophore. *Styles* 1-2 mm long, becoming connate for up to half their total length. *Seed* ovoid, brown or pale, c. 0.5 mm long, smooth.

#### KEY TO SUBSPECIES:

*Pseudanthia* 3 per head (rarely, in depauperate plants, some heads with only 2 pseudanthia) ..... a. ssp. *cephaloformis*  
*Pseudanthium* solitary (very rarely, some heads with 2 pseudanthia) ... b. ssp. *murrayi*

#### a. subspecies *cephaloformis*

Each head with 3 pseudanthia, 2 bisexual and the third lacking the stamen. Rarely, a minority of heads with 2 pseudanthia, one of them lacking the stamen. Leaves with scarious sheaths subequal to the manifestly recurved lamina. Outer bract with a recurved lamina subequal in length to the expanded basal sheath. (Fig. 1b).

#### DISTRIBUTION:

*Western Australia* — Scattered in the south-west in the Darling, Avon, Irwin and Eyre districts.

*Victoria* — Scattered in the State west of Bendigo, extending south as far as the northern Grampians and north to Hattah Lakes; frequent in Wyperfeld National Park and the Little Desert.

#### ECOLOGY:

Growing in seral communities where vegetation cover is sparse, typically on substrates of low fertility and subject to water stress, such as salt pans, sand hills, lithoserai moss beds, and former gold workings.

Annual, flowering in September to October. Seed collected in the Little Desert in November 1978 was found to have a dormant period of about 3 months, germinating in March.

#### SPECIMENS EXAMINED (total 29):

*Western Australia* — c. 27 km N. of Young R. crossing on Ravensthorpe-Esperance main rd., 10.x.1968, Donner 2957 (PERTH); Bolgart, viii.1953, Erickson s.n. (MEL 545750); 3½ mi S. of Morawa, 29.viii.1945, Gardner s.n. (PERTH); Tutaning Reserve, 17 mi S.E. of Pingelly, 17.ix.1962, Royce 7566 (PERTH); Watheroo N.P., 7.x.1971, Royce 9708 (PERTH); 29 km N. of Cleary, 2.ix.1967, Wilson 6088 (PERTH).

*Victoria* — Eastern Lookout Area, Wyperfeld N.P., 5.xi.1960, Beaglehole 5190 (MEL 532507; MEL 1502448); Dimboola Flora Reserve, 9.x.1960, Beaglehole 7454 (MEL 532513); Moora Moora Reservoir, 30.ix.1967, Beaglehole 17311 (MEL 532505); Lendrook Salt Lake, Hattah Lakes N.P., 3.x.1960, Beaglehole 19291 (MEL 532511); Mt. Zero, Grampians, 21.viii.1968, Beaglehole 28193 (MEL 532512); N. of Black Flat, Wyperfeld N.P., 14.ix.1968, Beaglehole 28267 (MEL 532510); Lunar Clearing, Wyperfeld N.P., 6.x.1968, Beaglehole 28952 (MEL 532509); Rudd's Rocks, Wyperfeld N.P., 7.x.1968, Beaglehole 28989 (MEL 532508); Pine Flats, Wyperfeld N.P., 9.x.1968, Beaglehole 29142 (MEL 532506); Little Desert N.P., 3.xi.1978, Cooke 228 (MEL 537434); Ironstone Hill, 3 mi N. of Bendigo, 3.x.1952, Melville 1393A (MEL 537440); near Dimboola, 30.ix.1893, Reader s.n. (MEL 1502447); Little Desert, Lowan, 9.x.1898, Reader s.n. (MEL); Little Desert, Lowan, 20.xi.1898, Reader s.n. (MEL); Sandy Desert, Lowan, x.1898, Reader s.n. (MELU 11832); Victoria, n.d. St. John s.n. (MEL 537318); Puzzle Flat, Bealiba, 5.x.1936, Willis s.n. (MEL); Faulkner Ck. Timber Reserve, 14.ix.1960, Willis s.n. (MEL 1502449); Webster's Lookout, Hattah Lakes N.P., 15.x.1960, Willis s.n. (MEL 1502450); near Lake Hindmarsh, n.d., n. coll. (MEL).

#### NOTES:

The three pseudanthia are borne between the two primary bracts and are not closely associated with either, apparently representing a single cymose group terminal on the axis.

b. subspecies **murrayi** (J.M. Black) D.A. Cooke, comb. & stat. nov.

Basionym: *C. murrayi* J.M. Black in *Trans. Roy Soc. S. Aust.* 47: 367-368 (1923); Black, *Fl. S. Aust.* 1: 179 (1943).

Type: North Pearson Island, South Australia, i.1923, *T.G. Osborn.* (Holo: AD 96012011 !; Iso: AD 97918146 !).

Each head with 1 bisexual pseudanthium; rarely, a minority of heads with a second pseudanthium lacking the stamen. Leaves with scarious sheaths manifestly shorter than the slightly recurved lamina. Outer bract with a  $\pm$  recurved lamina subequal to, or up to twice as long as, the expanded basal sheath.

DISTRIBUTION:

*Western Australia* — Boxer Island.

*South Australia* — North Pearson Island.

ECOLOGY:

Occurs in similar habitats to ssp. *cephaloformis*.

SPECIMENS EXAMINED (total 4):

*Western Australia* — Boxer Island, Recherche Archipelago, 8.xi.1950, *Willis s.n.* (MEL 545751; PERTH).

NOTES:

The bisexual pseudanthium of subspecies *murrayi* is borne between the two primary bracts, apparently terminating the main axis. In one head examined a second, female pseudanthium was present; in others, a minute multi-lobed structure was observed beside the gynoeceum and possibly represents a vestigial second pseudanthium. The differences between this taxon and typical *C. cephaloformis* seem insufficiently clear-cut to retain it as a separate species; however the specimens previously determined as *C. murrayi* lie outside the range of variation of all other *C. cephaloformis* material, and it is here treated as a subspecies.

*C. cephaloformis* is related to *C. polygya*; it is distinguished by the broader head, with primary bracts never becoming brown and indurated; the compact, burr-like habit; and the stamen being free from the gynophore.

3. **Centrolepis caespitosa** D.A. Cooke, sp. nov.

Herba nana glabra, dense caespitosa, pulvinos rotundatos ad 25 mm diametro formans. *Caulis* ex axillis foliarum inferiorum repetite ramificans, internodia 0.5-2 mm formans. *Folia* vaginis basalibus angustis scariosis usque ad 2 mm longis, in laminis filiformibus atrantibus usque ad 9 mm longis et 0.2 mm latis transientibus. Apex folii acutus, emucronatus. Folium summum ad cataphyllum acutum scariosum 1-2 mm reductum. *Capitulum* cylindricum, super internodio 1-2 mm longo terminans. *Bracteae primariae* 2, suboppositae, capitulum includentes. *Bractea externa* vagina hyalina 1.5-3 mm longa, ecarinata sed manifeste plurinervata, in lamina foliaceo 2.5-4 mm longa sensim transiens. *Bractea interna* angusta, hyalina, carinata 1.5-2 mm longa in apicem foliaceum recurvum usque ad 0.6 mm longum terminans. *Bracteae secundariae* nullae. *Pseudanthium* solitarium bisexuale. *Stamen* unicum gynophoro discretum, filamentum 3-4 mm, anthera ovato-elliptica c. 0.5 mm longa. *Gynoeceum* 3-6 carpido in gynophoro biseriato alterne superposito. *Styli* 1-2 mm usque ad dimidium coalescentes. *Semen* brunneum ovoideum c. 0.4 mm longum, laeve.

TYPUS: Beenup, W.A., 26.xi.1904, *A. Morrisou s.n.* (Holo: PERTH !).

Small densely tufted glabrous herb, forming rounded cushions up to 25 mm diameter. *Stem* repeatedly branching from the axils of the lower leaves, forming internodes 0.5-2 mm long. *Leaves* with narrow scarious basal sheaths to 2 mm long passing into filiform laminae, dark-pigmented in dried material, up to 9 mm long and 0.2 mm wide. Leaf tip acute, lacking a mucro. Uppermost foliar leaf on each branch reduced to an acute scarious cataphyll 1-2 mm long. *Head* cylindric, c. 0.5 mm wide, terminal on an internode 1-2 mm long. *Primary bracts* 2, subopposite, enclosing the head. Outer bract with a hyaline sheath 1.5-3 mm long, lacking a keel but with several prominent nerves, grading into a leaf lamina

2.5-4 mm long. Inner bract keeled, hyaline, narrow, 1.5-2 mm long terminating in a recurved foliar tip up to 0.6 mm long. *Secondary bracts* absent. *Pseudanthium* 1 per head, bisexual. *Stamen* 1, not adnate to the gynophore, filament 3-4 mm, anther ovate-elliptic c. 0.5 mm long. *Gynoecium* of 3-6 carpels superposed alternately biseriate on a gynophore. Styles 1-2 mm long, becoming connate for up to half their total length. *Seed* brown, smooth, ovoid, c. 0.4 mm long. (Fig. 1a).

DISTRIBUTION:

Known only from the type locality in Western Australia, but may be more widespread and overlooked due to its small size.

ECOLOGY:

Annual, flowering in spring.

NOTES:

*C. caespitosa* is apparently related to *C. polygyna*, having a narrow, terete head containing a single pseudanthium, and a cataphyll below each head. The hyaline texture of the primary bracts is associated with the habit of the plant, the heads being immersed in the dense cushion of foliage with only the bract tips, stigmas and anthers exposed. This is the most distinctive feature of the species. *C. caespitosa* is also distinguished from *C. polygyna* by the free stamens, the fewer carpels, and the narrow, acute cataphylls.

4. ***Centrolepis humillima*** F. Muell. ex Benth., 'Fl. Austr.' 7: 203 (1878). Type: Salt lagoons north of Stirling Range, x.1867, *F. Mueller s.n.* (Holo: K n.v.; Iso: MEL 536059 ! MEL 536060 !).

Small tufted glabrous herb. *Stem* repeatedly branching from the lower leaf axils forming internodes less than 0.5 mm long. *Leaves* with a scarious, sheathing base 0.8-2 mm long passing into a recurved, broad-linear lamina 2-8 mm long and up to 1 mm wide, keeled, conduplicate towards the base, ending in an obtuse or acute tip without a mucro. Uppermost leaf reduced to an acute scarious cataphyll. *Head* terminal on an internode less than 0.4 mm long, or quite sessile;  $\pm$  cylindric, laterally compressed, 0.5-1 mm broad. *Primary bracts* 2, subopposite, tightly enclosing the head. Outer bract with a dark, keeled, indurated basal sheath 1.5-3.5 mm long passing abruptly into a leaf lamina 2-5 mm long. Inner bract 1-2.2 mm long, scarious to indurated,  $\pm$  conduplicate, the base exposed and often swollen, the apex acute and enclosed by the outer bract, margins hyaline. *Secondary bracts* absent. *Pseudanthium* 1 per head, bisexual, in the axil of the outer bract. *Stamen* 1, not adnate to the gynophore; filament 1.5-3.5 mm, anther elliptic 0.5-1 mm long. *Gynoecium* of 1-7 carpels superposed alternately biseriate on a gynophore. Styles up to 2.5 mm long, becoming connate for less than half their total length. *Seed* ovoid, brown or pale, c. 0.5 mm long, regularly pusticulate.

DISTRIBUTION:

*Western Australia* — Scattered in the Avon, Stirling, and Eyre districts of the south-west.

ECOLOGY:

Growing in similar habitats to *C. cephaliformis*. Apparently annual, flowering in September to December.

SPECIMENS EXAMINED (total 5):

*Western Australia* — Neridup, c. 3 km NE of Howick Hill, 21.ix.1968, *Eichler 19912* (PERTH); Cape Arid N.P. along Balladonia Road, 5.xii.1971, *Royce 10153* (PERTH); Wongan Hills, 17.ix.1963, *Willis s.n.* (MEL 1501982).

NOTES:

*C. humillima* appears to be related to *C. polygyna*, from which it is distinguished by the

form of the leaf, the carpel number, and the laterally compressed head (see Key).

The inner primary bract is reduced and almost concealed in this species. Bentham (1878) did not regard it as a bract, but described it as "a scarious complicate scale opposed to the bract". Its position directly on the main axis of the head, subopposite to, and slightly above, the outer primary bract indicates that it is homologous to the inner primary bract of other species of *Centrolepis*. In texture it is similar to the basal sheath of the outer primary bract, and unlike the nerveless hyaline secondary bracts of other species.

5. Reduced states of *Centrolepis polygyna* (R.Br.) Hieron. in *Abh. Naturf. Ges. Halle* 12: 210 (1873).

Small glabrous annual herb. *Stem* repeatedly branching from the lower leaf axils forming internodes up to 1 mm long. *Leaves* 4-8 mm long with a scarious sheathing base 1-3 mm long passing into an erect or recurved terete linear lamina terminating in a hyaline mucro. Uppermost foliar leaf reduced to an obtuse scarious sheathing cataphyll up to 3 mm long. *Head* terminal on an internode at least 0.5 mm long; erect, cylindric, 0.8-1.2 mm wide. *Primary bracts* 2, opposite, keelless, closely enclosing the head. Outer bract with a brown, scarious  $\pm$  indurated basal sheath 3-4 mm long bearing a terete,  $\pm$  recurved awn-like lamina 3-7 mm long. Inner bract brown, scarious,  $\pm$  indurated, acute, lacking a lamina, 3-4 mm long. *Secondary bracts* absent. *Pseudanthium* solitary, bisexual. *Stamen* 1, the filament 3-4 mm long, adnate to the gynophore for c. 0.5 mm at the base; anther ovate-elliptic, 0.6-1 mm long. *Gynoecium* of 6-14 carpels superposed in subopposite pairs on a gynophore. *Styles* c. 1.5 mm long, becoming connate at the base only. *Seed* brown, ovoid, c. 0.5 mm long, smooth. Whole plant often becoming dark-pigmented in the fruiting stage.

DISTRIBUTION AND ECOLOGY:

Recorded from localities in Victoria and Tasmania, and possibly occurring elsewhere, usually in close proximity to taller states of *C. polygyna* and intergrading with them, in sites such as sand hills and moss beds on rock. Flowering September to November.

SELECTED SPECIMENS EXAMINED:

*Victoria* — Mt. Arapiles, south side, 23.xi.1964, *Beaughte* 6570 (MEL); Dimboola Flora Reserve, 9.x.1960, *Beaughte* 7455 (MEL 532539); Mt. Arapiles, S.E. slope, 22.ix.1968, *Beaughte* 28686 (MEL 532504); Dimboola Reservoir, x.1948, *Beaughte* 39697 (MEL 534085); Sandy desert, Lowan, 1892, *Reader s.n.* (MEL); wet pastures, Lowan, 16.x.1898, *Reader s.n.* (MEL).

*Tasmania* — Killiecrankie Bay, Flinders Island, 24.ix.1966, *Whinray* 694 (MEL 536063); Prime Seal Island, Furneaux Group, 17.x.1972, *Whinray* 1503 (MEL 533586).

NOTES:

The state of *C. polygyna* described above represents one extreme of variation within a highly polymorphic species, or perhaps species aggregate. There appears to be no discontinuity in variation between such plants and typical *C. polygyna*, and it is not known whether the reduced state has any genetic basis or is due solely to phenotypic plasticity. It is not proposed to describe it as a separate taxon.

Reduced *C. polygyna* is sometimes confused with the related scapeless species of *Centrolepis*. Distinguishing characters are given under the respective species.

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# A NEW AUSTRALIAN LICHEN: CLADONIA KURINGAIENSIS

by

A.W. ARCHER\*

## INTRODUCTION

The fruticose lichen genus *Cladonia* contains a number of species which are placed together in the *Cladonia verticillata* group. This group is characterised by esorediate, corticate, cup-shaped podetia (scyphi), with each scyphus producing central proliferations in the form of further scyphi. The typical species of the group, *Cladonia verticillata* (Hoffm.) Schaer. and the related species *Cladonia calycantha* Nyl., *Cladonia gymnopoda* Vain., *Cladonia pseudogymnopoda* Asah. and *Cladonia verticillaris* (Raddi) Fr. contain the  $\beta$ -orcinol depsidone fumarprotocetraric acid as the only lichen compound present (Zopf 1908, Asahina 1940, 1970, 1943). Other members of the group contain fumarprotocetraric acid with atranorin — *Cladonia krempelhuberii* (Vain.) Vain. (Asahina 1956) and *Cladonia subcervicornis* (Vain.) Kernst. (Asahina 1943) — or fumarprotocetraric acid with homosekikaic acid — *Cladonia calyciformis* Nuno (Nuno 1972) — or lack fumarprotocetraric acid and contain other lichen compounds; *Cladonia dissimilis* Asah. contains atranorin and homosekikaic acid (Asahina 1940) and *Cladonia rappii* Evans contains psoromic acid (Evans 1952). *Cladonia verticillata* and *Cladonia krempelhuberii* are the only members of this group reported to occur in Australia (Weber and Wetmore 1972).

A recent chemical examination of specimens of *Cladonia verticillata* sens. lat. from the Sydney region showed that specimens with squamulose scyphi contained stictic acid in addition to fumarprotocetraric acid (Archer 1979); squamulose specimens contained only fumarprotocetraric acid and were identified as *Cladonia verticillata* (Hoffm.) Schaer. The specimens with stictic acid and squamulose scyphi are now differentiated as a separate species.

## DESCRIPTION

### *Cladonia kuringaiensis* A.W. Archer, sp. nov.

Habitus thalli ut in *Cladonia verticillata* sed squamulis in marginibus scyphorum et acidum sticticum acido fumarprotocetrarico usuali contentia.

The appearance of the thallus as in *Cladonia verticillata* but with squamules on the margins of the scyphi and containing stictic acid as well as the usual fumarprotocetraric acid.

*Primary squamules* persistent or disappearing, up to 5 mm long, irregularly wedge-shaped, resembling the squamules on the scyphi; upper side green to olive-green, below white. *Podetia* dull whiteish-green to olive-green, esorediate, with or without squamules, arising from the upper side of the primary squamules, 20-40 mm tall and up to 1.5 mm diam., expanding into small cups to 5 mm diam., appearing wider due to the presence of marginal squamules; each podetium with one or more proliferations from the centre of the closed cup; margins of the scyphi squamulose with irregularly crenate squamules 2-4 mm long and 0.5-1 mm wide; *cortex* continuous or areolate, the areoles smooth and the interspaces white; *Apothecia* sessile or on short stipes, 0.3-0.5 mm in diam.; pale brown to reddish-brown, flat, becoming convex; *ascospores* 8/ascus, simple, ellipsoid, colourless, 10-15 x 3-4  $\mu$ m.

REACTION: K+ weak yellow-brown; C-; Pd+ yellow becoming red. Fumarprotocetraric and stictic acids were shown to be present in an acetone extract by thin-layer chromatography and the presence of stictic acid was confirmed by mass spectrometry (Archer 1979).

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*Muelleria* 4 (3): 273-275 (1980).





Fig. 1. *Cladonia kuringaiensis*. Typical specimens showing squamulose scyphi. Scale in millimetres.

TYPE COLLECTION: Australia, New South Wales, Ku-ring-gai Chase National Park, on soil on sandstone rock, near Spring Gully Creek, 4 km SSW of Bobbin Head, 20.i.1979, *Archer* 620 (Holotype: MEL 1023704; Isotype: NSW).

ALSO EXAMINED:

*New South Wales* — Murphy's Glen, Blue Mountains N.P., near Woodford, 20.xi.1976, *Archer* 161; Side of creek below Woody Pear Dam; Blue Mountains N.P., near Glenbrook, 16.vii.1977, *Archer* 210; Side of Biamea Creek, Dahrug N.P., near Wiseman's Ferry, 24.xii.1977, *Archer* 352 (MEL 1023705); Mt. Gibraltar, Bowral, 23.iii.1978, *Archer* 429 (NSW); Buffalo Creek, Field of Mars Reserve, North Ryde, 25.iv.1978, *Archer* 451 (NSW); Near Spring Gully Creek, 1.5 km SSW of Bobbin Head, Ku-ring-gai Chase N.P., 8.viii.1978 (topotype), *Archer* 520 (NSW); Near Spring Gully Creek, 2.5 km SSW of Bobbin Head, Ku-ring-gai Chase N.P., 8.viii.1978, (topotype), *Archer* 523 (NSW); Side of track from Murphy's Glen to Bedford Creek, Blue Mountains N.P., 10.ix.1978, *Archer* 698; Side of Waratah Creek, Ku-ring-gai Chase N.P., near Berowra, 3.ii.1979, *Archer* 629; Mount Wilson, 11.viii.1979, *Archer* 715.

### DISCUSSION

The specific epithet *kuringaiensis* refers to the Ku-ring-gai Chase National Park from where the holotype was collected. Typical specimens are illustrated in figure 1.

*Cladonia verticillata* (Hoffm.) Schaer. is also known in a squamulose form, *Cladonia verticillata* f. *phyllocephala* (Flot.) Oliv. (Thomson 1967; plate 10, fig. 49b), while *Cladonia calycantha* f. *foliolosa* Vain., recorded from Venezuela and Peru (Vainio 1894),

was described as "a somewhat inconstant variety, with the margins of the scyphi squamulose". *Cladonia kuringaiensis* is distinguished from these morphologically similar forms by the presence of stictic acid.

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# THE OCCURRENCE OF PHYLLOCLADUS ASPLENIIFOLIUS (LABILL.) HOOK.F. IN VICTORIA, PRIOR TO 1100 B.P.

by

D.M. CHURCHILL\* AND J.R. DODSON†

## SUMMARY

Evidence is described for the occurrence of *Phyllocladus* prior to 23,000 B.P.‡ in the Dandenong Ranges, and from 9670 B.P. until nearly 1100 B.P. in western Victoria. The dates when this conifer died out in the mainland vegetation of Victoria are deduced from the level at which the pollen disappears from pollen profiles obtained from peat sediments that have accumulated in volcanic crater lakes and valley bogs. The distinctive pollen of *Phyllocladus* has not been identified in the present atmospheric pollen rain on the mainland.

## INTRODUCTION

The present paper is concerned with studies of *Phyllocladus* pollen from late Quaternary deposits in the Dandenong Ranges and western Victoria. *Phyllocladus*, a conifer in the family Podocarpaceae, is not known in the extant flora of Victoria or from elsewhere on the Australian mainland. However, fossil wood (*Phyllocladoxylon annulatus* Patton, 1958), leaves (*Phyllocladus asplenioides* Ett., 1888; *P. simplex* Deane, 1904; *P. morwellensis* Deane, 1925) and pollen (*Phyllocladus palaeogenicus* Cookson and Pike, 1954) provide evidence that the genus was present in Victoria and adjacent states during the Lower Tertiary.

Fossil stumps of *Phyllocladus*, identified by H.D. Ingle, have been found in buried soil developed on Lower Pliocene marine rocks and sealed off by basalt (Gill, 1964) near Hamilton, Victoria. The age of these stumps is thought by Gill to be of Upper Pliocene to Pleistocene age. *Phyllocladus* fossils of Tertiary age are known from elsewhere in Australia (e.g. Kemp, 1978). However there is no published account of fossil *Phyllocladus* material in sediments of younger age, and hitherto no evidence to indicate when the genus died out on the mainland.

Today, the genus *Phyllocladus* is represented in Australia by only one species, *P. aspleniifolius* (Labill.) Hook.f. (*P. rhomboidalis* Rich.). This is a tree up to ten metres high, found in the temperate rainforest and wet sclerophyll forests of Tasmania. The six other species of *Phyllocladus* occur outside Australia, in New Zealand and Malaysia (Borneo, New Guinea, Philippines and Moluccas).

## POLLEN MORPHOLOGY AND REPRESENTATION

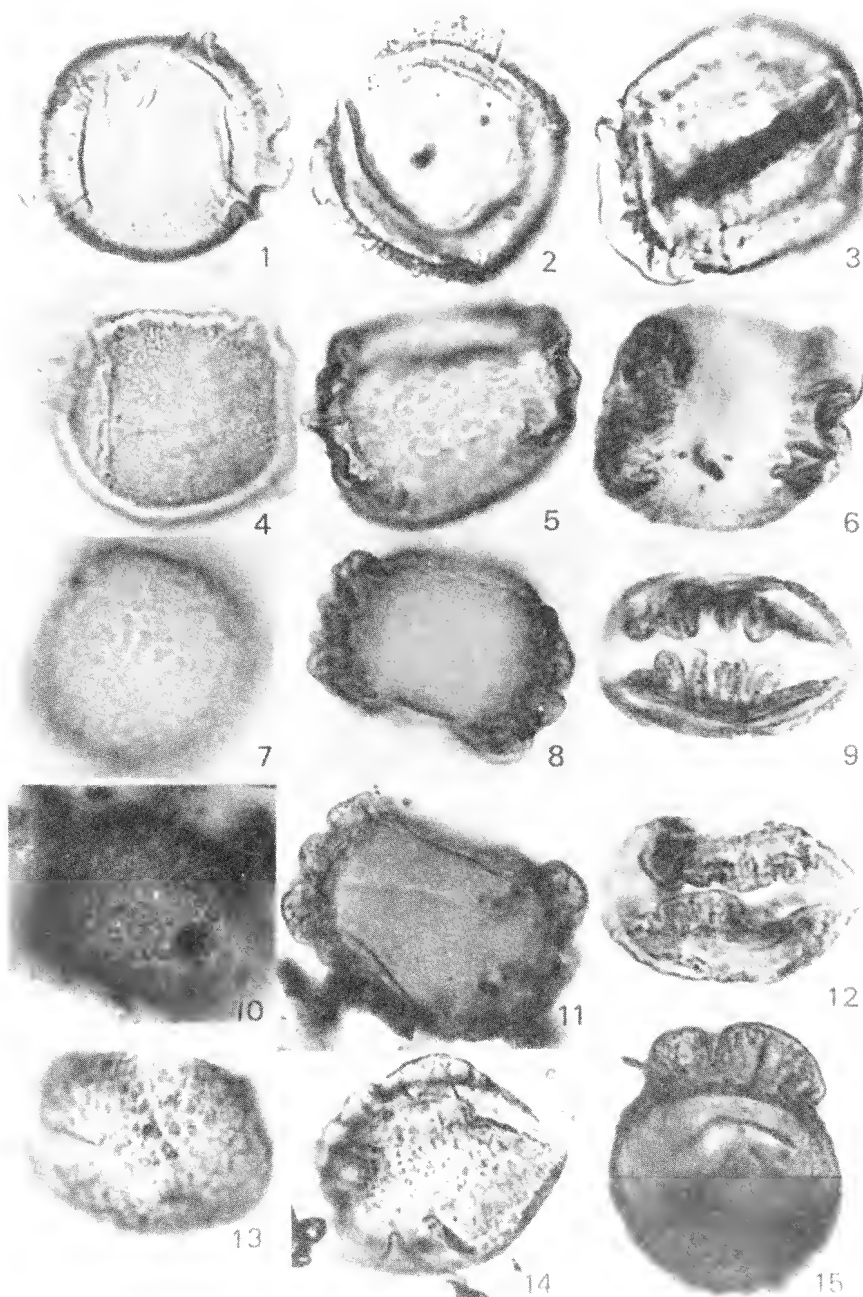
Plate 1 shows fossil and reference *Phyllocladus* pollen grains that were photographed following the methods of Samuelson (1965). The fossil grains described herein were found in the Dandenong Ranges and western Victoria. The surface features of these fossil *Phyllocladus* pollen grains were similar to those of living *P. aspleniifolius* (Labill.) Hook.f., *P. hypophyllus* Hook.f. and *P. glaucus* Carr. The average length to breadth ratio of the body of the fossil grains (i.e. not including the bladders) most closely matches that for *P. aspleniifolius* (the Tasmanian species) and *P. alpinus* (from New Zealand); see Table 1. From these diagnostic features we believe the Victorian Quaternary pollen grains to be those of *P. aspleniifolius*.

Whereas most of the fossil pollen found had expanded, with bladders diverging from

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‡B.P. = Before Present, i.e. before 1952 anno domini.



## PLATE 1

1. *Phyllocladus alpinus* Hook.f. New Zealand. 2 — *P. trichomanoides* Don, New Zealand. 3 — *P. hypophyllus* Hook.f., Malesia. 4 — *P. alpinus* showing surface pattern. 5 — *P. glaucus* Carr, New Zealand, showing distal surface pattern and bladders. 6 — *P. aspleniifolius* (Labill.) Hook.f., Tasmania. 7 — *P. aspleniifolius* showing the pattern of the proximal surface. 8 — *P. aspleniifolius* Tasmania; pollen grains with this type of morphology are not as common as 9 — *P. aspleniifolius* Tasmania. 10, 11 and 15 — *Phyllocladus aspleniifolius* from peat (nekron mud) in L. Keilambete. 12 — *P. aspleniifolius* from 20-20.5 cm depth in Sherbrooke Forest core. 13 — Surface pattern of *P. aspleniifolius*, Sherbrooke Forest core, 23-23.5 cm. 14 — *P. aspleniifolius* from 21-21.5 cm depth, Sherbrooke Forest. 15 — see 10 above.

Species	Locality	Number of pollen grains measured	Average length $\mu\text{m}$	Average breadth $\mu\text{m}$	Length: breadth ratio
fossil <i>Phyllocladus</i>	Vic.	5	40.7	31.5	1.29
<i>P. aspleniifolius</i> (Labill.) Hook.f.	Tas.	25	29.8	23.6	1.26
<i>P. alpinus</i> Hook.f.	N.Z.	25	40.5	30.7	1.32
<i>P. trichomanoides</i> Don	N.Z.	25	39.5	32.3	1.22
<i>P. glaucus</i> Carr	N.Z.	11	32.4	22.9	1.41
<i>P. hypophyllus</i> Hook.f.	Malaysia	25	30.1	16.5	1.82
<i>P. major</i> Pilger	N.G.	Pollen not studied			

Table 1. Length : breadth ratios of *Phyllocladus* pollen.

the body of the grain (e.g. Plate 1: 8, 11), a few grains (e.g. Plate 1: 12) had the bladders folded inwards towards each other. In reference slides prepared from living *Phyllocladus aspleniifolius* pollen, both types of grain were present but the latter form was always the most common.

The transport and representation of *Phyllocladus aspleniifolius* pollen in Australia has not been studied in any detail. Macphail and Jackson (1978) show values around 1-2% of the modern regional pollen rain around Lake Tiberias in Tasmania. In this case the source was most likely the extensive stands of *Nothofagus cunninghamii* rainforest about 50 km to the south and south-east of the site. *Nothofagus* pollen was present in values of 2-6%. Hope (1978) reported values of 0-2% of both *Phyllocladus* and *Nothofagus* pollen on Hunter Island also at some 50 km from the nearest extensive stands of rainforest.

In contrast modern pollen rain studies in the New Zealand region (Moar, 1969, 1970, 1971; Dodson, 1976; Pocknall, 1978) show much higher representation of *Phyllocladus* pollen at similar and greater distances from source vegetation than in the case for the Australian examples. This is most likely due to a combination of factors including possibly higher pollen production of New Zealand *Phyllocladus* species and the relatively low total pollen production of vegetation of some vegetation types on offshore islands around New Zealand (see Dodson, 1976).

To gain some insight into the contemporary pollen rain in the vicinity of Lake Gnotuk, water samples were taken in 1967 at various depths in the lake and the pollen identified. *Nothofagus* pollen was present, in quantities less than 1% of the total pollen, but no *Phyllocladus* pollen was found. Howard and Hope (1970) have examined peat from *Nothofagus* forest on Wilsons Promontory. There they found that *Nothofagus cunninghamii* accounted for some 50-60% of the pollen present, but they did not record *Phyllocladus* pollen. Similarly Dodson (1977) found no evidence of *Phyllocladus* pollen in the modern pollen rain of Lake Leake in South Australia. From uppermost samples of other published Victorian pollen diagrams (Hope, 1974; Ladd, 1978 & 1979) it appears that *Phyllocladus* pollen is not a component of the modern pollen rain on the southern portion of the Australian mainland.

#### QUATERNARY OCCURRENCE

Towards the headwaters of Sherbrooke Creek in the Dandenong Ranges east of Melbourne, there are three small peat bogs (145° 21.35' E.; 37° 52.92' S.) upstream from the dam in Sherbrooke Forest. A 10 cm (4 inch) diameter core was taken with percussion drilling tools through the deepest part and the sediments were analysed for pollen.

Lake Keilambete (142° 52' E.; 38° 12' S.) and Lake Elingamite (143° 0.3' E.; 38° 21.3' S.) are two volcanic crater lakes (maars) in the Western District of Victoria. Both lakes were formed during the volcanic activity that began in the late Tertiary and continued through to the Holocene (Ollier and Joyce, 1964). Three cores, one from the centre and one offshore in L. Keilambete, and one from the centre of L. Elingamite, were taken in March 1970, with the aid of a Mackereth corer. Fossil pollen was extracted from these cores using the standard techniques described by Faegri and Iversen (1964).

*Phyllocladus* pollen (Plate 1) and *Nothofagus cunninghamii* pollen grains were found

in highly organic peat (nekron mud) and volcanic ash sediments in Lakes Keilambete and Elingamite, and the peaty silt from Sherbrooke Forest. The levels of their occurrence in the cores and their frequencies, relative to the total number of pollen and spores, are listed in Table 2.

In Sherbrooke Forest, *Phyllocladus* pollen occurs no higher in the peat than 51.0-52.0 cm below the surface. A radiocarbon date (1-4613) of  $22,870 \pm 690$  B.P. was obtained from peat (at 47.0-49.5 cm) immediately above this level, and indicates the terminal date before which *Phyllocladus* became extinct in the Dandenong Ranges.

Locality	Radiocarbon date (B.P.)	Sediment type	Level (cm) depth from top of core	<i>Phyllocladus</i> %	<i>Nothofagus</i> %
Lake Keilambete	765 $\pm$ 135	Peat	50	—	0.10
		Peat	60	—	0.06
		Peat	90	—	0.28
		Dolomite	95-105	—	0.18
		Peat	110	0.09	0.09
		Peat	120	0.12	—
	4930 $\pm$ 200	Peat	170	0.10	—
		Peat	180	0.08	0.23
		Peat	210	0.11	—
		Peat	220	—	0.06
		Peat	250	—	0.07
		Peat	260	0.08	0.03
		Peat	270	—	0.09
		Peat	280	—	0.09
		Peat	290	0.05	0.21
		Peat	320	0.07	0.07
		Peat	330	0.10	0.19
		Peat	340	0.10	0.10
		Peat	360	0.05	—
		Peat	370	0.09	0.09
		Peat	380	—	0.16
		Peat	390	0.07	—
		Peat	400	0.16	—
		Peat	410	—	—
		Peat	420	0.04	—
		Peat	430	0.11	—
		Peat	450	—	0.11
		Peat	460	0.11	—
		Peat	470	—	—
		Peat	480	—	—
	9670 $\pm$ 135	Peaty Volcanic Ash	493	0.09	—
		Volcanic Ash	500	—	—
Lake Elingamite	9380 $\pm$ 140	Peat	0-4	—	—
		Volcanic Ash	5	—	0.11
		Volc. Ash	10	0.07	0.67
		Volc. Ash	20	—	0.69
		Volc. Ash	30	—	0.49
		Volc. Ash	40	0.34	—
		Volc. Ash	50	—	0.41
		Peat	60	0.11	0.11
		Peat	70	—	0.16
Sherbrooke Forest	22870 $\pm$ 690	Peat	0.0-51.0	—	—
		Peat	47.0-49.5	—	—
		Peat	51.0-52.0	0.10	0.40
		Peat	53.5-54.5	0.01	0.09
		Peat	56.0-57.0	—	2.00
		Peat	57.5-60.0	0.10	1.50

Table 2. Relative frequencies of fossil *Phyllocladus* and *Nothofagus* pollen in Lake Keilambete, Lake Elingamite and Sherbrooke Forest.



In Lake Elingamite, the *Phyllocladus* pollen was contained in volcanic ash deposited in standing fresh water, and in the peat beneath the ash. Only 4 cm of undated peat is found overlying the volcanic ash in this core, but the top of the peat that underlies the volcanic ash has been dated at  $9380 \pm 140$  B.P. (I-6224).

In Lake Keilambete the *Phyllocladus* pollen occurs in peat overlying volcanic ash. The base of this peat at its contact with the ash has been dated (I-6226) at  $9670 \pm 135$  B.P. The peat, with a dolomite band, is approximately 480 cm thick, and the *Phyllocladus* pollen is found from the base of the peat to within 120 cm from the top of the peat; that is 365 cm above the top of the volcanic ash. From radiocarbon dates (I-5244)  $4930 \pm 200$  B.P. and (I-5245)  $765 \pm 135$  B.P. from the 280 cm and 104-110 cm levels respectively, it seems reasonable to date the intermediate level of 120 cm at approximately 1100 B.P.

It is evident (Dodson, 1974a) that conditions from 1100 to 765 B.P. were becoming increasingly dry. The level of the lake water fell and became increasingly saline until a bed of dolomite (95-105 cm below the top of the peat) was formed from 765 to about 450 B.P. The pollen in the peat above the dolomite indicates that the climate once more became wetter. A careful search however, has failed to demonstrate the presence of *Phyllocladus* in this uppermost peat, although *Nothofagus* pollen continues in similar frequencies to the surface levels (Dodson, 1974a).

The occurrence of very low (less than 1%) and roughly equal amounts of both *Phyllocladus aspleniifolius* and *Nothofagus cunninghamii* pollen in the sediments of Lakes Keilambete and Elingamite, means that either pollen was carried there over long distances from forests in cool wet areas, or that these species were represented by small numbers of plants in the vicinity of the crater lakes. The pollen diagrams from Lakes Elingamite and Keilambete (Dodson 1971, 1974a) show that the bulk of the local pollen produced at that time came from Poaceae, with small numbers of *Eucalyptus* and *Casuarina*, indicative of open grassland with few trees. This is not the type of community in which *Nothofagus* or *Phyllocladus* are found today, and it seems improbable that plants from these taxa were growing any closer to the lakes than the Otway Ranges, due to the lack of suitable habitats.

#### CLIMATE

Meteorological data published by Davies (1965), Bureau of Meteorology (1968, 1975) and Linforth (1977) provides sufficient resolution for circumscribing the temperature and rainfall requirements of *Phyllocladus aspleniifolius* as follows: a mean annual rainfall in the range of 1500-2500 mm; mean monthly temperatures in January of 12-16°C and in July of 3.5-7°C.

On the mainland of Victoria areas that approach these bioclimatic conditions can be found today in the Dandenong Ranges, near Mt. Baw Baw, Mt. Donna Buang, Lake Mountain, Mount Torbreck, and in the Otway Region between Lavers Hill and Tanybryn. In each case the annual rainfall is sufficient but the mean January temperatures are one or two degrees too high. At Tanjil Bren, O'Shannassy and the Black Spur with mean July temperatures in the range 4-5°C, the annual range in temperature may be too great for *Phyllocladus* to survive even if it were introduced there.

At Sherbrooke in the Dandenong Ranges the present annual rainfall is 1262 mm. The mean monthly temperatures are: for January 18°C, July 6.8°C. For Zeehan on the west coast of Tasmania where *Phyllocladus* thrives with *Nothofagus* the mean annual rainfall is 2444 mm, mean January temperature is 14.2°C and mean July temperature is 6.8°C.

Using the presence of *Phyllocladus* as a basis for selecting localities for comparison of climates then it follows that the climate of the Dandenong Ranges prior to 23,000 B.P. could have been comparable to the present climate of Zeehan. The mean annual rainfall in the Dandenong Ranges has therefore decreased by comparison to that in 23,000 B.P. by some 1200 mm, the January mean temperature has risen by nearly 4°C, and the July mean temperature has not changed.

However, the presence of fossil *Podocarpus alpinus* with the *Phyllocladus* pollen in the Sherbrooke Dam site means that comparisons of climate would be more appropriate with localities such as Lake St. Clair, where the mean annual rainfall is 1514 mm, mean monthly January temperature is 12.7°C and the July mean temperature is 3.45°C. This comparison

indicates a climatic change in the Dandenong Ranges since 23,000 B.P. of a 250 mm decrease in annual rainfall, a rise of 5°C in the mean temperature for January, and a rise of 3.3°C in the mean July temperature.

## DISCUSSION

*Phyllocladus aspleniifolius* occurs today in association with the cool wet *Nothofagus cunninghamii* forests of Tasmania (Busby and Bridgewater, 1977). In Victoria, *Nothofagus cunninghamii* occurs in cool wet forest communities and is restricted to Gippsland, central eastern Victoria, Wilsons Promontory, and the Otway Ranges. The Otway Ranges is the nearest (65 km SE) of these sites to the Western District lakes in which the fossil pollen was found.

The Sherbrooke Forest peat in the Dandenong Ranges contains fossil *Phyllocladus* pollen, only in the lowermost 10 cm of peat in the core. The radiocarbon date of roughly 23,000 B.P. dates the layer immediately above the *Phyllocladus* pollen and indicates the approximate date at which *Phyllocladus* died out in the Dandenong Ranges.

In Lake Elingamite, *Phyllocladus* pollen was present in the peat, prior to the eruption in 9380 B.P.  $\pm$  140. The volcanic ash sediments were deposited in water, and although they are not suitable for radiocarbon dating they contained *Phyllocladus* pollen. The last volcanic eruption in the area of the Western District was about 9500 B.P. and it is clear that *Phyllocladus* was present prior to the volcanic period and was not affected by the eruption.

The uppermost level at which *Phyllocladus* was recorded in Lake Keilambete was 120 cm at a date of approximately 1100 B.P. The more or less continuous occurrence of *Phyllocladus* pollen in the Keilambete sediments from the ash layer to the 120 cm level in conjunction with the radiocarbon dates, establishes the presence of the species from 9670  $\pm$  135 B.P. until 1100 B.P. in the vicinity of the western districts of Victoria. *Phyllocladus* pollen has also been found in south-eastern South Australia (Dodson, 1974b) but the most recent occurrence is around 1950 B.P. These data suggest the possibility of a climatic explanation for the synchronous extinction of *Phyllocladus aspleniifolius* in western Victoria.

Dolomitic carbonate beds, in the peat from the centre of Lake Keilambete, have been studied in great detail by Dodson (1974a) and shown to have formed when the water levels were falling and close to drying out. Conditions were certainly drier than at present. The peat immediately underlying the dolomitic bed in the centre of Lake Keilambete was radiocarbon dated at 765  $\pm$  135 B.P. (I-5245). This suggests that conditions were becoming progressively drier until around 750 B.P. after which time they became progressively wetter up to the early 19th century levels first observed by white settlers. Since that time they have been falling (Churchill et al., 1978).

Similar and approximately synchronous water level changes have been described from changes in local pollen and sediments from Lake Leake in nearby south-eastern South Australia (Dodson, 1974b) and from ratios between *Eucalyptus diversicolor* and *E. calophylla* pollen from Holocene peat deposits in Western Australia (Churchill, 1966 & 1968). It is reasonable to suggest that increasingly dry conditions from 1450 B.P. to 750 B.P. were responsible for the final extinction, by 1100 B.P. of *Phyllocladus* in western Victoria. The *Nothofagus cunninghamii* rainforest in the region undoubtedly underwent a considerable reduction over the same period but this remains to be documented by pollen analysis and dating of sediments closer to these forests than the Western District's volcanic crater lakes.

Studies from eastern Victoria (Hope, 1974; Ladd, 1978 & 1979) show essentially no change in the Holocene apart from a wetter period between about 8000 B.P. and 3000 B.P. Rainforest communities however show relative stability since that time and this could indicate that over the last 3000 years there has been a change in the factors which control the relative amounts of moisture distributed in different parts of Victoria.

It is important to record in this context, the occurrence and more recent extinction of *Phyllocladus aspleniifolius* from King Island, in Bass Strait, since 1945. *Phyllocladus* is known to have been present on King Island at 37,000 B.P. (Jennings, 1959) and in more

recent time until the end of World War II. After this a soldier settlement scheme cleared the few surviving stands on the east coast. Seedlings that germinated since then have all failed to survive in the regrowth scrub that now dominates these sites. It is more than twenty years since the last *Phyllocladus* seedlings were seen there — in a deep gully between Grassy Mine and Mt. Stanley (Willis, pers. comm.).

### CONCLUSIONS

Whereas the fossil evidence indicates that both *Phyllocladus* and *Nothofagus* were once widespread elements of the Tertiary floras of southern Australia, conditions later became relatively marginal. In western Victoria *Phyllocladus aspleniifolius* pollen is reliably dated in sediments as recent as 1100 to 750 B.P. but has not been found in younger sediments examined. The disappearance of *Phyllocladus* from the mainland corresponds with a period of increasing dryness that lasted from around 3000 B.P. and culminated around 750 to 450 B.P. in western Victoria. Small pockets of the species that had survived on King Island in Bass Strait until the arrival of European man were killed off by about 1950.

*Phyllocladus aspleniifolius* in Australia now survives only in the wind-sheltered, well-watered rainforests of Tasmania.

Bioclimatic comparisons suggest that prior to 23,000 B.P. in the Dandenong Ranges, the rainfall was 250-1200 mm higher than at present; the mean January temperatures were 4-5°C lower and the mean July temperature was some 0-3.3°C cooler than today.

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# HYDROCLEYS NYMPHOIDES (BUTOMACEAE) IN AUSTRALIA

by

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## SUMMARY

The first known naturalized occurrence of the South American aquatic monocotyledon *Hydrocleys nymphoides* in Australia is reported from Valencia Creek, Central Gippsland, Victoria. As the species has been a cultivated ornamental in Australia since at least 1896 without, until now, being recorded as naturalized, it is thought unlikely ever to become a major troublesome weed. However, deliberate planting in natural situations should be avoided. The apparent inability of Australian populations to set seed is probably a major factor in preventing naturalization as the plant is able to thrive in varied climates. A note of caution is sounded against the importation of any fresh strains of *H. nymphoides*.

A full botanical description and illustration are provided. A brief account of naturalization in other countries is given.

## INTRODUCTION

The South American genus *Hydrocleys* Commers. ex L.C. Rich. (also spelt *Hydrocleis* by some authors) contains about nine species (Pedersen, 1961), of which only *H. nymphoides* is widespread in cultivation. The glossy foliage and yellow flowers of *H. nymphoides* make it attractive for ornamental ponds and it was introduced into horticulture soon after it was described (as *Stratiotes nymphoides*) in 1806. Hooker (1833) reports successful flowering in April 1833 in the aquarium of the Botanic Garden of Liverpool, England, of plants grown from seed obtained near Buenos Aires. Cook (1974) states that *H. nymphoides* has been grown in heated greenhouses in Europe since 1830. In Australia it has been cultivated since at least 1896.

## DESCRIPTION

**Hydrocleys nymphoides** (H. & B. ex Willd.) Buch. in *Abhandlungen des Naturwissenschaftl. Vereines zu Bremen* 2: 2 (1868).

BASIONYM: *Stratiotes nymphoides* H. & B. ex Willd. 'Linn. Spec. Pl.' 4 (2): 821 (1806).

SYNONYMS: *Hydrocleys commersonii* L.C. Rich. in *Mém. Mus. Hist. Nat.* 1: 368 and 373, t.18 (1815).

*Limnocharis humboldtii* L.C. Rich., l.c. 1: 369, t.19<sup>1</sup> (1815).

ENGLISH VERNACULAR NAME: "Water Poppy".

Robust, perennial, emergent, stoloniferous, freshwater, aquatic, usually with a milky sap. *Stolons* to several metres long, terete, rooting at the nodes, the internodes to 60 cm long x 5-6 (-11) mm diameter; nodes each producing a cluster of perhaps 5 to 7 leaves and several flowers with the petioles and peduncles subtended by membranous, ovate to lanceolate bracts c. 3-4.5 (-6.5) cm long. *Leaves* floating or erect; petioles terete, sheathed at the base, to 60 cm long x 8 mm diameter, with many fine longitudinal cavities and with transverse septa at intervals of a few -10 mm, the septa visible externally; blades broad-elliptic to broad-ovate to suborbicular, 3.5-13.5 cm long x 3-12 cm broad, obtuse to rounded at the summit, shallow-cordate (or rounded on younger leaves) at the base, medium to dark green,

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*Muelleria* 4 (3): 285-293 (1980).



thick-textured, glabrous, smooth, glossy above (and also, at least in the erect leaves, below), swollen with spongy tissue on the undersurface along the midrib and particularly at the junction of the midrib and petiole; blades with 3-4 curved-longitudinal veins on either side of the midrib (the fourth vein when present being close to the leaf margin and sometimes only in the basal portion of the blade) and with many close-set transverse veins radiating from along the whole length of the midrib. *Flowers* bisexual, c. (4-)5-6 cm across, solitary in the leaf axils but appearing crowded at each node, held well above the water surface on terete peduncles to 24 cm long x 4 mm diameter, the peduncles with longitudinal cavities and transverse septa similar to those of the petioles. *Sepals* 3, imbricate, ovate, obtuse, deep green and coriaceous with very narrow translucent margins, c. 16-20(-25) mm long x 6-10 mm broad, persistent even in fruit. *Petals* 3, alternate to and almost twice as long as the sepals, pale yellow with deeper yellow at the base, extremely broad-obovate ( $\pm$  fan-shaped, usually a little broader than long), imbricate and together forming a bowl-shaped flower, thin-textured and lasting only one day (perhaps two), shrivelling in the afternoon, c. (3-)3.5-4 cm long x (3-)4.5-5 cm broad. *Stamens* hypogynous, many, about two-thirds as long as the sepals, in several series surrounding the gynoecium, the outer ones sterile, the inner ones fertile; sterile stamens reduced to flattened, awl-shaped staminodes, about as many as the fertile ones; fertile stamens (c. 24 on specimens seen) with dorsiventrally-flattened, linear, deep purple filaments c. 3-4 mm long and anthers 5-6 mm long; anthers deep purple, narrow-linear, basifixed, bilocular, the two locules connected along their full length by a connective which is about as broad as each of the locules, each locule dehiscent by a longitudinal slit; pollen yellow. *Gynoecium* superior, c. 11-13 mm long, of 6 carpels on specimens seen (5-8 reported by other authors), the carpels free or attached only at the base; carpel with a  $\pm$  narrow-ovoid ovary tapered into a short, thick style; stigma purple, papillate, capping the style and also extending a short way down its adaxial surface; ovules numerous, scattered over the carpel wall. *Fruits and seeds* not found on Australian material but from other descriptions the fruiting carpels are free or nearly so, beaked by the persistent style, c. 15 mm long, and open by the adaxial suture; seeds are several to numerous, small, horseshoe-shaped.

Seedlings produce ribbon-like, juvenile leaves. Mature adult plants can revert to a juvenile-leaved state when subjected to conditions of poor nutrition, e.g. immersion in deep or heavily-shaded water; transference to a barren substrate; drastic pruning of foliage or roots (Arber, 1920; Sculthorpe, 1967). Neither seedlings nor ribbon leaves have been noted in Australian populations.

Mature plants in cultivation may produce small plantlets along the stolons. These plantlets detach and float to the surface and may eventually take root. They seem more abundant towards the end of the growing season and when nutrition levels are low. Plantlets have not been noted in the Malmsbury or Valencia Creek populations (see later).

**FLOWERING TIMES:** *Brisbane* — about Sept. to end of April, with some flowers produced beyond then if the season remains warm. *Sydney* — (Nov.) Dec. to March; Jan. to March under lower nutrient levels. *Valencia Creek* — Jan. (also earlier?) to March and possibly early April.

More detailed descriptions on some aspects are supplied by Argue (1973, pollen), Stant (1967, anatomy), Sattler & Singh (1974, floral development) and Charlton & Ahmed (1973, developmental morphology).

#### EXTRA-AUSTRALIAN OCCURRENCES

*Hydrocleys nymphoides* occurs naturally from Venezuela to Brazil and south to Buenos Aires, Argentina. It might therefore be expected to grow best in tropical to subtropical climates. However, it can become naturalized in warm temperate or even cool temperate regions. Perry (1961) states that in England it will grow outside in summer but generally must be wintered indoors although "we have often wintered it outdoors in mild winters . . .". Muenscher (1944) reports the species as naturalized in ponds and pools in the southern United States of America, but in the north it "grows well in shallow water but



Fig. 1. *Hydrocleys nymphoides*. a — habit of flowering plant, x 0.4. b — fertile stamen, x 4. c — gynoecium, x 2. d — style and stigma, x 10. e — carpel, with portion of wall removed to show scattered ovules, x 3. f — leaf, abaxial surface, showing venation and swollen midrib, x 1. g — portion of flower showing the sepals, 6 carpels, several fertile stamens and 2 staminodes; the petals and most of the stamens and staminodes removed for clarity, x 2. From Aston 2006, Valencia Creek, 9.v.1979 (MEL 1512178-84) and Miles, Valencia Creek, 14.iii.1979 (MEL 1512174-5).



will not survive the winter in the open''. Sculthorpe (1967) lists *H. nymphoides* as naturalized in the warmer regions of U.S.A., in New Zealand and in Japan. In Fiji (Smith, 1979) the species is sparingly naturalized and regarded as probably a fairly recent introduction, the only collection having been made in 1969.

Cheeseman (1914) first recorded the naturalization of *H. nymphoides* in New Zealand. It was then plentiful in several lagoons or backwaters near the Thames River, at Te Aroha, (37° 32' S.; 175° 43' E.) North Island, and apparently rapidly increasing. It had been planted nearly twenty years previously in one of the lagoons where by 1914 it covered an acre or more in area and was blocking drains and water-channels. Because of its attractiveness it had been transferred to other lagoons and was rapidly increasing at each new location. R. Mason (pers. comm., 1973) indicates that nothing more was heard of the species in New Zealand until 1961 when a specimen was forwarded from the Te Aroha district, and again in 1971 when it was recorded in Glen Eden, west of Auckland, where it was blocking drainage in a hydro station. Mason had not found the species in the Te Aroha district when searching for it a year or so prior to 1961 so the 1914 infestations may have died out or declined, and the 1961 collection have been made from a fresh infestation.

## AUSTRALIAN OCCURRENCES

### Cultivated

In Australia *H. nymphoides* has been in cultivation since at least 1896, as a mixed collection (MEL 1512176-7) contains material grown in the Melbourne Botanic Gardens in December 1896 and February 1908. Early collections from the Sydney Botanic Gardens show that it was cultivated there in February 1899 (NSW 143692) and February 1904 (NSW 143691). More recently there is a December 1949 collection (NSW 143690) from the Sydney Botanic Gardens and a November 1957 collection (NSW 143693) from Castle Hill, Sydney, while Oakman (1958) listed the species amongst those "commercially obtainable plants which can be easily grown in Queensland garden pools". Today *H. nymphoides* is still commercially obtainable and widely grown as an ornamental in outdoor ponds, for example at the Mt. Cooth-tha Botanic Gardens, Brisbane, the Royal Botanic Gardens, Sydney, at Malmsbury, central Victoria and in the Burnley Gardens, Melbourne.

**BRISBANE** — Three pieces were planted in an ornamental lagoon at the Mt. Cooth-tha Botanic Gardens in January 1976 and within two years they had covered an area of 2000-2500 square metres. The original pieces were obtained from a public garden in Southport, south-east of Brisbane. At Mt. Cooth-tha nutrient levels in the lagoon are high due to seepage through adjacent thick mulches of sewerage sludge, manures and animal stall litter. Because of the excessive rapidity of spread *H. nymphoides* is now being eradicated with herbicide. Plant sections which, at times, were washed over the lagoon wall and down the creek below the lagoon have not survived as the creek dries out. (B. Dangerfield, pers. comm.).

**SYDNEY** — In about 1973 several pieces planted in a pond in the Royal Botanic Gardens made very rapid growth. The gardens plants are grown in rotted manure covered in sand while other plants grown by one of us (S.W.L.J.) at Carlton, near Botany Bay, Sydney, are potted into a mixture of about 75% blood and bone and 25% sand to produce good flowering.

**MALMSBURY** — In a large ornamental lake at Malmsbury (37° 11' S.; 144° 23' E.), about 20 km south-east of Castlemaine, central Victoria, very little *H. nymphoides* was present in early 1973. By June 1979 it had spread to form dense growth over four patches c. 12 x 6, 12 x 6, 5 x 5 and 1 x 1 metres, thus occupying a total surface area of approximately 170 square metres (Aston, pers. obs.: MEL 1513587-90; BRI; CANB; NSW). The lake is filled by stormwater drainage from the adjacent sealed highway and has no nutrients added to it (Kyneton Shire Secretary and R.H. Wood; pers. comm.). Overflow is to the nearby Coliban River but a search of this in June 1979 for about 0.5 km downstream from the lake revealed no sign of *H. nymphoides*.

### Naturalized

There is only one naturalized occurrence of *H. nymphoides* known in Australia. It is at 37° 48-49' S., 147° 00-00.5' E., in Central Gippsland, Victoria, about 2-3 kilometres north-east of Valencia Creek township and approximately 17-18 kilometres north of Maffra. Plants are well-established over a distance of approximately one kilometre in a gully which lies to the east of the Valencia Creek stream. The gully runs south-west into the Creek, which then runs south to join the Avon River just north of Valencia Creek township (Fig. 2).

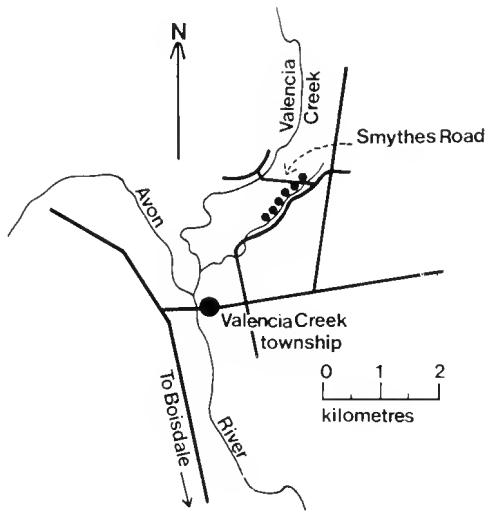


Fig. 2. Map showing the full extent, May 1979, of the naturalized occurrence of *Hydrocleys nymphoides* at Valencia Creek. Extent indicated by row of dots.

The species was first reported from this location in January 1979 by L. Cameron, a local farmer concerned with its growth on his property. Mr. Cameron, through M. Hitchins and T. Miles, both of the State Rivers and Water Supply Commission, provided a voucher specimen (NSW 143340). Subsequent specimens were collected by T. Miles on 14th March 1979 (MEL 1512174-5; NSW) and H. Aston on 9th May 1979 (MEL 1512178-84; AD; BRI; CANB; NSW).

The gully where *H. nymphoides* grows runs through cleared dairying farmland and contains a small watercourse. In its upper region this watercourse is perhaps only 0.5-1 metre wide, with water from a few centimetres to a metre deep, and in the shallower places may dry out almost completely in summer. In its lower region several sections have been widened and deepened to form water-storages for stock. Growth of *H. nymphoides* is most prolific in these storages. In March 1979, with high water level, several storages united to form a 300 metre long lagoon completely edged with *H. nymphoides*. Plants were rooted in edgewaters from a few to c. 60 cm deep and extended floating stolons out over water to three metres deep. Edging plants were densely massed with intertwined stolons and leaves, the crowded leaves typically standing erect and up to 45 centimetres above the water surface. Less-crowded stolons over deep water produced leaves with the blades typically

floating flat on the water surface. Growth was luxuriant and plants were flowering well although seed was not being set.

There are apparently high nutrient levels in the storages as the surrounding farmland is top-dressed with superphosphate while washings from the farm dairy flow directly into the storages.

The Valencia Creek population originated from a few plants placed in the watercourse approximately 10 to 15 years ago by the late Mrs. H. Smythe, a water-lily fancier on an adjacent property. This planting was just north of Symthes Road, at or near the upstream limit of the present population. From here the species spread fairly rapidly downstream. In March and May 1979 a search was made downstream from the present population along the gully, Valencia Creek and Avon River to the road crossing of the Avon immediately west of Valencia Creek township. *H. nymphoides* was not located during this search.

Although there have been at least two major floods which could have assisted further spread of the species throughout the district, *H. nymphoides* is presently restricted to the gully described. The apparent failure of the plants to set seed is probably the major cause of non-establishment in adjacent areas.

Local residents regard the present rate of spread as much reduced compared with the initial rate, but as a precaution L. Cameron in mid-March 1979 treated plants in his lower storage (sited at the downstream extremity of the population) with 2,4-D. The initial effect of this treatment was considerable dying-off of foliage, but the longer-term effect is yet unknown.

## Factors affecting growth and distribution

### NUTRITION AND CLIMATE

Estimates of the surface areas occupied by three populations are:

Malmsbury: 170 sq. m. covered in 6 years.

Valencia Creek: 1500-2500 sq. m. in 10-15 years.

Brisbane: 2000-2500 sq. m. in 2 years.

These figures show that plants in Brisbane have the fastest rate of growth. Comparison of growth rates of the first two populations is less obvious, but assuming an initial surface area of 1 sq. m. and a geometrical growth rate (135.35% increase per year calculated from the above data), and extrapolating, it is estimated that the area which would be covered by the Malmsbury population in 9 years is 2215 sq. m. and in 10 years is 5214 sq. m., i.e. coverage at Malmsbury could be similar to that at Valencia Creek. Although accurate information is lacking, the data available suggest that there is probably no major difference between the growth rates of these two populations.

For successful cultivation *H. nymphoides* requires high nutrient levels. Perry (1961) reports that rich loam is required. Plants in Sydney and Brisbane (p. 288) need high nutrient levels for growth and flowering while the naturalized occurrence at Valencia Creek has a high nutrient inflow. In contrast the Malmsbury population continues to grow and flower without added nutrient; the nutrient level has not been measured but there is no circumstantial evidence to indicate that it is particularly high. The considerable difference in growth rates between the Brisbane and Valencia Creek populations, both with seepage or inflow from manures, suggests that nutrient-enrichment, although beneficial, is not the only limiting factor in the growth of *H. nymphoides* in Australia (see next paragraph). This suggestion is supported by comparison of the Valencia Creek and Malmsbury populations, which apparently have similar growth rates but different nutrient inputs.

Air temperature and frost frequency comparisons are given in figures 3 and 4 respectively. Although air temperatures are not simply related to water temperatures the figures show the climatic extremes within which *H. nymphoides* is known to grow in Australia. The importance of warmer, subtropical weather in promoting growth is indicated by the greater growth rate of plants in Brisbane compared with those in Valencia Creek and Malmsbury. The species is certainly cold-sensitive and winter die-back occurs at all localities, regardless of frost. The Valencia Creek population exhibited luxuriant growth in mid-March but by 9 May foliage was partly-yellowed and decaying and only young leaves remained completely

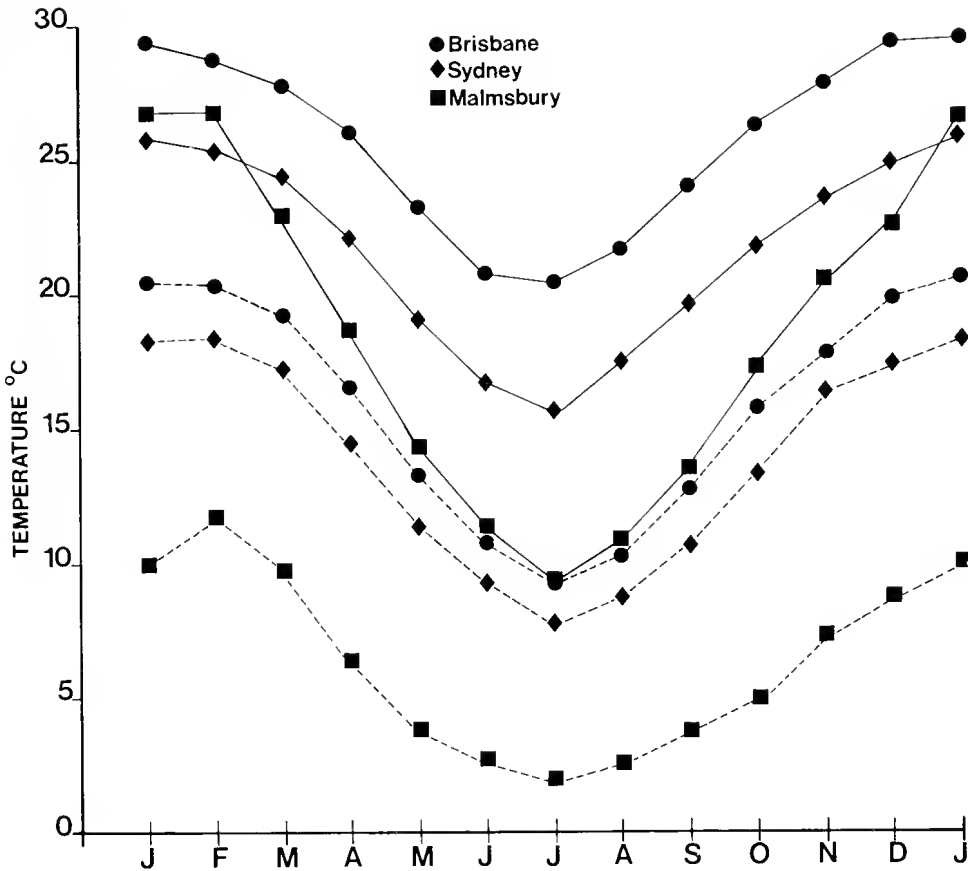


Fig. 3. Temperature variation with time of year at Brisbane, Sydney and Malmsbury. Exact figures for Valencia Creek are not available but they lie between those of Malmsbury and Sydney. *Solid line*: mean daily maximum temperature per month. *Broken line*: mean daily minimum temperature per month.

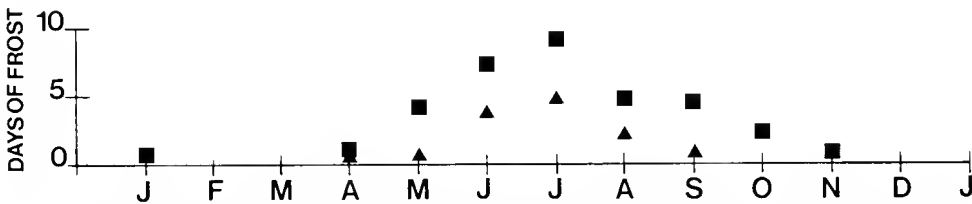


Fig. 4. Average number of days of frost per month at Kyneton (equivalent to Malmsbury) and Maffra (equivalent to Valencia Creek). Brisbane and Sydney are frost-free; the Sydney location may rarely experience a frost. Kyneton shown by *squares*, Maffra by *triangles*.

green. At Malmsbury on 18 June foliage was still abundant but yellowing and decay were evident. In Sydney plants cease growth and start to die back in winter. Brisbane plants also die back but always retain some floating leaves; leaves produced under low temperatures are usually smaller.

### SEED PRODUCTION

No seed was found in living material from any of the four locations examined, and no seedlings have been located. In addition we found no seed in any of the NSW herbarium collections taken from plants cultivated in earlier years. Plants currently grown for sale at Gedye Water Gardens, East Doncaster, Victoria, also fail to produce seed.

At Valencia Creek on 9 May the older flowers from which the petals and stamens had fallen or decayed still contained intact carpels but the carpel walls were flaccid and easily broken and there was no sign of setting seed. Even in mid-March, during a summer with temperatures above average, T. Miles (pers. comm.) found that seed was not being set. On 18 June at Malmsbury carpels remaining on old flowers were still intact but they disintegrated on touching and held no seeds.

R. Mason (pers. comm., 1973) found no seed in glasshouse plants grown in New Zealand. Flowers from Glen Eden (see p. 288) had well-developed carpels but no seed. Mason suggested that good seed is seldom, if ever, produced in New Zealand and this may be the reason why *H. nymphoides* has not spread in that country.

### Weed potential

*H. nymphoides* can become an established perennial in Australia from subtropical to warm temperate regions, including localities experiencing a number of overnight frosts in winter. In the warmer regions such as Brisbane its growth rate is rapid. However, although the species has been widespread for many years as a cultivated ornamental, it has not previously been reported as naturalized in Australia. Even this one naturalized occurrence developed from an initial deliberate planting. It is therefore unlikely that the material now present in Australia will lead to the species ever becoming a troublesome weed in this country, although it may at times create a local problem. Planting in natural waters should be avoided.

The apparent failure of Australian populations to set seed is probably a major factor limiting widespread establishment of *H. nymphoides* in this country. The collection (NSW 143692) gathered in Sydney Botanic Gardens in 1899 is annotated "Plant from which spec. was taken originally came from New Zealand . . .". It is possible that all material in both New Zealand and Australia has been derived from one initial introduction to New Zealand, and is therefore all part of a single clone, with an inherent inability to set seed. If this supposition is correct then there could be danger in allowing any fresh introductions of the species into Australia from other countries, as cross-pollination between the old and new strains could lead to the formation of viable seed. This possible change from sterile to fertile individuals could change *H. nymphoides* into a potential weed species, particularly in warmer regions.

### ACKNOWLEDGEMENTS

To Mr L. Cameron, farmer, of Valencia Creek who first drew the attention of authorities to the presence of *H. nymphoides* in his district; to Mr M. Hitchins, State Rivers and Water Supply Commission, Maffra and Mr T. Miles, S.R. & W.S.C., Rochester, who first investigated the infestation at Valencia Creek; to Mr T. Miles additionally for supplying specimens and information to the authors; to Mr B.G. Dangerfield, Curator, Mt. Cooth-tha Botanic Gardens, Brisbane who supplied all information concerning the plants at Mt. Cooth-tha; to Mr S.G. Porter, Kyneton Shire Secretary and the Rev. R.H. Wood, Inglewood (formerly of Malmsbury) for answering enquiries concerning the Malmsbury occurrence; to Dr R.W. Johnson, Director, Queensland Herbarium, for ascertaining that no collections of *H. nymphoides* are held at BRI; to Miss R. Mason, DSIR, Christchurch, New Zealand who in 1973 forwarded information on the species in that country; to Mr D. Gedye, Gedye Water Gardens, East Doncaster, Melbourne for information on plants grown at those Gardens; to the Commonwealth Bureau of Meteorology which supplied temperature and frost data; and finally to Miss Anita Podwyszynski for the execution of all figures accompanying this article, the authors wish to express their gratitude.

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## BOOK REVIEW

*Lichens of South Australia*. Rex B. Filson and Roderick W. Rogers. Handbooks of the Flora and Fauna of South Australia. Government Printer, South Australia. 1979. 197 pp., 28 b.&w. figures, 16 col. plates, 21 x 15 cm. Price \$10.50.

Of all the plant groups to which botanists and naturalists have longed for a handbook, it is lichens where the need has been most acutely felt. This book, the first lichen flora of any usefulness in Australia, will fortunately be useful outside as well as within the State of South Australia, since the authors have prudently incorporated many species from adjacent states whose future discovery in South Australia might be expected.

The Handbook covers something like 250-300 lichens, some in great detail, others only at generic level depending on the state of knowledge of the group concerned. It therefore covers virtually all the lichens that are identifiable without further research; for the most part this means "crustose lichens . . . to generic level and the fruticose and foliose lichens to specific level". There are keys to families and to genera within families, using fertile material, and a further key to genera which places more emphasis on vegetative characters. Within each genus there is a key to species, if appropriate, and brief descriptions; as an aid to further work there are short lists of specimens examined.

For a great many species some kind of illustration is provided — either a photograph or, at least, a drawing of the ascospores. The book is clearly aimed primarily at non-lichenologists in the hope of inducing others to take up this fascinating and beautiful group of plants. It is therefore a pity that the lichenological jargon — which is perhaps the most rampant of any area of botany — had not been more muted. It is essential for any newcomer to the group to acquire a knowledge of the appropriate terminology but there is little excuse for "primuline-yellow", "pseudoperithecia" (not defined), "epiphloeic" as well as "corticolous", and "endophloeic" where the glossary gives "endophloedal". Despite these, no botanist should have difficulty in using the book. Both keys and descriptions seem clear and unambiguous and there are sufficient illustrations to be of great help. There are 28 pages of line drawings and black and white photographs, mostly clear, and 16 plates of what would have been, from the originals by Bruce Fuhrer, superb colour photographs but for the printing. When, oh when, is the scientific public going to be released from the incubus of Government Printers? The colour reproductions would reflect no particular credit on one of the cheaper weekly magazines produced for public consumption and the type faces used throughout are — to my eyes — both antique and ugly. It is a shame that a book, whose publication reflects so much credit on the State of South Australia should have been produced in so unworthy a manner. Perhaps the answer is that for \$10.50 one must not cavil, but competent printing ought to cost no more than incompetent, and even an extra dollar or so would have been worth paying to have accurate colours in the *Parmelia* plates, where colour is a critical characteristic: not many species, in my experience, are a muddy submarine blue.

These criticisms aside, the book is neatly produced, a handy size, and cheap, and it can be expected to have a wide market in Australasia. It may well trigger off a much-needed revival in lichenology in Australia and certainly deserves to. The authors are to be warmly commended on their work and no self-respecting field botanist or botanical library should be without it.

GEORGE A.M. SCOTT

## BOOK NOTICE

*Descriptive notes on Papuan Plants*, by Ferdinand von Mueller, parts 1 to 9, first published by the Government Printer, Melbourne, in 1875 to 1890, is now available in a limited facsimile edition produced in 1979 by Boerhaave Press, P.O. Box 1051, Leiden, Holland (Price Dutch florins 125). The facsimile edition is enhanced by the addition of an index to parts 6 to 9 — only parts 1 to 5 were indexed in the original.

## BOOK REVIEW

*Kosciusko alpine flora*. A.B. Costin, M. Gray, C.J. Totterdell and D.J. Wimbush.  
Published by CSIRO, Melbourne and William Collins Pty. Ltd., Sydney, 1979.  
408 pp.; 352 col. and 19 b.&w. photographs; maps. Recommended price \$25.00.

*Kosciusko alpine flora* is written by two alpine ecologists and one systematic botanist and is illustrated by a scientific photographer, all attached to the staff of the Commonwealth Scientific and Industrial Research Organization. It provides an ecological and floristic account of the alpine vegetation of the Kosciusko region in south-eastern New South Wales. The boundary is set at c. 1830 metres (6000 ft) altitude or, whenever the treeline extends somewhat above this level, then at the treeline. In the authors' words, "Despite its small size in relation to Australia as a whole (about 0.001%), the Kosciusko alpine area supports a rich, diverse and in part distinctive flora which compares in beauty and interest with better-known alpine floras such as those of the Rocky Mountains and the Swiss Alps".

The book has three main sections. The first of these describes the Kosciusko environment — its evolution in terms of climatic changes and geology, the history and effects of human use and abuse, and present-day management under the control of the National Parks & Wildlife Service of New South Wales. The second section introduces the plants and describes the plant communities, distinguishing eleven alliances (e.g. the *Brachycome-Danthonia* alliance; the *Carex-Sphagnum* alliance) and providing a table of these showing the dominant and the characteristic species of each and the formations (e.g. Sod tussock grassland; Fen; Heath) to which they belong. A useful six-page table lists all of the alpine vascular plants of the region, approximately 200 species and well-defined subspecies and varieties, some yet to be formally described. Additional tables give the 21 species which are currently regarded as endemic to the region and the 27 naturalized species.

The final section of the work is floristic, with clear botanical keys to families, genera and species and with the taxa arranged systematically. For each species the scientific name with authority and place of publication is given, together with a common name where one exists, a good botanical description, and paragraphs for "distribution" (worldwide) and "notes and habitat". Under the latter heading there are brief notes on the geographical and ecological occurrence within the Kosciusko region, comments on taxonomic points such as diagnostic features or unresolved problems, and a useful miscellany of ecological or biological notes whenever these are available for the species concerned, e.g. the near-extinction from grazing and burning of *Chinachloa frigida* but its subsequent recovery since 1944 when the Kosciusko summit was protected from grazing; the sensitivity to fire and the rates of growth of *Podocarpus lawrencei*; the hemi-parasitism of *Euphrasia* spp.

All sections are liberally illustrated with coloured photographs that are both artistic and informative, and add both to the beauty of the book and to the understanding of the written content. The photographs consist of carefully-selected landscapes which illustrate points discussed in the first two sections and 291 plant portraits which illustrate almost every species described in the floristic section. Cross-referencing of the descriptions and photographs is clear and direct. Several diagrams and maps complete the illustrative material, while a bibliography, a glossary of botanical terms and an index to plant names end the book.

*Kosciusko alpine flora* is clearly set out and well-produced. The text is authoritative and well-written and demonstrates the depth of knowledge and the wide experience of the authors in relation to their topic. Although written specifically for the Kosciusko region, much of the content is also applicable to other alpine areas of New South Wales, Victoria and Tasmania. The comprehensive bibliography of nearly 200 entries enhances the value of this flora to the serious students of plants and/or alpine regions while the wealth of photographic detail will aid and appeal to both the scientist and the amateur botanist alike. It appears that the stated aim of the authors and the photographer, "to combine scientific merit with popular appeal", has been successfully achieved.

HELEN I. ASTON



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